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A MONOGRAPH

OF THE

BRITISH SPONGIADÆ.

BY

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INTRODUCTION.

When I first undertook the history of the British Spongiadæ I did not contemplate giving figures of each species, believing that form and colour in these protean animals were frequently so much varied in each as to render them of but very little service in the discrimination of species, and I still, after much additional experience, remain of the same opinion as regards these two characters. But, as my knowledge of these animals became extended, I saw that the discrimination of nearly allied species might be considerably facilitated by magnified figures of the peculiarities of their organic structures, such as those of the dermal membrane, the skeleton, and especially of the forms and proportions of the spicula. Under these circumstances it became advisable, for the convenience of naturalists, to give figures of the most characteristic forms of each species accompanied by those of the spicula and the most striking portions of their organization, when necessary, for the determination of the species. In thus figuring the spicula, an average-sized adult one of each form that occurs on the sponge is given, along with the figure of the species, and where nearly allied ones have the forms of their spicula closely resembling each other, but varying to some extent in size, they are each figured of the same linear power for comparison.

When I have had a choice of specimens of any parti-

cular species I have made a point of not choosing exceptionally fine ones for figuring, but those representing about the average size and form, as best illustrating the general characters of the species.

The carrying out of this design necessitated a complete review of the structural peculiarities of the whole of the British species, and the accomplishment of this re-examination of them has led to the discovery of several errors of generic and specific determinations in Vol. II, of this work, and to their rectification in the present volume. Some of these errors have originated in the dilapidated condition of the single type-specimen that was the subject of examination and description, while in other cases generic and specific alterations have naturally arisen from an extended and more critical acquaintance with the British Spongiadæ.

The following is a list of the alterations in the genera and species that have been effected.

Hymeniacidon lingua, 'Mon. Brit. Spongiadæ,' Vol. II, page 187, is now *Raphiodesma lingua*, Plate XXVII, Vol. III.

Hymeniacidon floreum, Vol. II, page 190, is now *Raphiodesma floreum*, Plate XXXVII, Vol III.

Hymeniacidon jecusculum, Vol II, page 198, is now *Microciona jecusculum*, Plate LXXXIII, Vol. III.

Hymeniacidon Bucklandi, Vol. II, page 226, is now *Battersbyia Bucklandi*, Plate XCII, Vol. III.

Hymeniacidon plumosa, Vol. II, page 133, is now *Microciona plumosa*.

Microciona carnosa, Vol. II, page 133, is now *Microciona plumosa*.

Halichondria Hyndmani, Vol. II, page 264, is now *Isodictya Hyndmani*, Plate XLVI, Vol. III.

Chalina seriata, Vol. II, page 376, is now *Ophlitaspongia seriata*, Plate LXV, Vol. III.

Isodictya robusta, Vol. II, page 347, is no longer to be considered a species, as it was founded on a fragment of *Desmacidon Jeffreysii* before my ultimate acquaintance with more perfect specimens of that species.

Professor O. Schmidt, when he visited me to inspect my collection of British sponges, very kindly presented me with 33 small portions of specimens of his Adriatic sponges for examination and comparison with our British species. Of the species presented to me there were 6 of his genus Reniera, 3 of Esperia, 2 of Stelletta, 2 of Cacospongia, 2 of Clathria, 2 of Suberites, and 2 of his Axinella. Of the rest there was one specimen of each of the following genera: Spongelia, Gumina, Hircinia, Taguillia, Aplysina, Sarcotragus, Vioa, Tapiliato, Caminus, Spongia, Stegxella, Raspailia, and Cribella.

The whole of these genera were established by either Nardo or Professor O. Schmidt. Of Nardo's species Dr. Gray, in 'Proceedings' of the Zoological Society for 1867, page 495, justly observes, "almost all the species mentioned as belonging to the genera are new and not described in this paper ('Ausug aus einem neuen der Spongiarien Isis,' 1833), so that it is impossible to determine what they are except for such persons as have specimens named by the Author." In truth, Nardo's species described in Professor O. Schmidt's 'Die Spongien des Adriatischen Meere' and the two supplements may be considered rather as those of Schmidt than of Nardo. They may be conveniently consulted by reference to Dr. Gray's paper in the 'Proceedings' of the Zoological Society for 1867, page 497.

Dr. Schmidt does not found his genera and species on any definite anatomical principle, and in many cases they are so loosely constructed that the descriptions would embrace almost an unlimited series of very discrepant species. Thus in his description of Hircinia, we have "sponge of a lax texture, skin less dense." Of Dysidea, a remarkably distinct and well-characterised sponge, by the peculiarities of its skeleton structure, we have the following very indefinite generic character. "Sponge massive, skeleton irregular, netted." This loose mode of description may possibly serve the

purpose of the authors of such systems with comparatively few species to describe, but they can never convey correct information to the minds of their pupils and followers in an extensive course of studies. On the contrary, if we base our genera on the skeleton structures of the sponges, in accordance with the systems generally adopted by naturalists in their arrangements of the higher classes of the Animal Kingdom we have a permanent and invariable source of generic characters, however variable the species or individuals may be in size, form, or stage of development, so that the genus may be readily determined by even a minute fragment of the subject under consideration.

With these preliminary observations we will now compare the results of my examinations of the Adriatic sponges, presented to me by Professor Schmidt, and named by him in accordance with his own system of arrangement; with the genera to which they would have been referred according to the system of natural arrangement by means of the anatomical mode of structure of their respective skeletons.

The following are the results of the microscopical examination of the skeleton structures of the six species of Reniera that I received from Professor O. Schmidt.

Reniera Nardo.

R. digita, Schmidt. A Halichondria with rather short acuate spicula.

R. aquæductus, Schmidt. Halichondria with acerate spicula.

R. semitubulosa? Schmidt. Isodictya spicula acerate. This specimen is in a bad state for examination.

R. nigrescens, Schmidt. Halichondria with acuate spicula, with a stout and regularly constructed skeleton rete.

R. palmata, Schmidt. Isodictya with short, stout acerate spicula. A very distinctly developed skeleton.

R. dura or densa Nardo. A Desmacidon, in the structure of its skeleton rete, but of a closer and more compact arrangement than in any of our British species.

I received specimens of two species of Cacospongia Schmidt, *C. Mollior*, and *C. Scalaris*. The former proved to be a true spongia, with the slender, solid fibrous texture of the Turkey sponge of commerce, while the latter was an undoubted Verongia with the strikingly characteristic large inflexible canaliculated fibres so distinctly illustrative of that genus. The slightest microscopical examination of their structural peculiarities would have served at once to distinguish them as anatomically distinct genera.

In six species of Reniera therefore, we have three distinct types of organisation. Halichondria with the irregular and indefinite spiculo-reticulate structure of its first division. Isodictya with its regular scalariform spicular reticulation, and the widely separated skeleton of Desmacidon, composed of spiculo-fibrous structure. If this amount of structural discrepancy occurs in the examination of six specimens said to belong to the same genus, we may readily imagine the amount of confusion of structural character that we might expect to find in a more extended examination of the species referred to the genus Reniera by Professor Schmidt.

The three species of Esperia of which I received small portions all proved to belong to my genus Raphiodesma.

E. tunicata, Schmidt. Has acuate spicula and is closely allied to the British species *R. lingua*, but differs from it in having a profusion of small stout acerate tension and defensive spicula immediately beneath the dermis.

E. Bowerbankii, Schmidt. Has also acuate spicula.

E. Indian Ocean. Is not named. It is a very strongly characterised species.

Of the two species of stelletta, O. Schmidt, S. pumex, a very small fragment, is apparently a Tethea, from the radiating structure of the skeleton, and the numerous porrecto-ternate external defensive spicula at the dermal surface.

S. discophora. Is a pachymatisma with all the characteristic irregularity of the skeletons of that genus.

The two species of clathria Schmidt are both members of the same genus.

C. oroides, is a very distinct ophlitaspongia, apparently of a slender cylindrical form, with short stout smooth acuate internal defensive spicula.

C. coralloides is a densely compacted ophlitaspongia with internal defensive spicula of verticillately spined acuate form, very numerous.

The two Suberites Nardo.

S. massa is a Hymeniacidon with spinulate spicula, very closely resembling in structure our British species, *H. suberea.*

S. domunculus, is a Hymeniacidon with small spinulate spicula. In general structure it bears a close resemblance to our British species, *H. Carnosa.*

Of the two species of Axinella, Schmidt.

A. verrucosa, is a Halichondria with large acuate spicula; the skeleton structure is much confused.

A. polypodoides is a well-developed Isodictya, the primary lines of the skeleton bi-, or trispiculous; secondary lines rarely more than unispiculous, spicula acerate.

Of the Adriatic sponges, of which I received only one specimen of each genus—

Spongelia pallescens, Nardo, is a true spongia. Its fibrous structure and its mode of arrangement is precisely the same as that of the best Turkey sponge of commerce. Its membranous and sarcodous structures

are the same as those of the Turkey sponges in the state they come from the sea.

Gumina exandata, Schmidt, apparently not a sponge. It is a dense cartilaginous substance without spicula, keratose fibre, or any other attribute of the spongiadæ.

Hircinia variabilis, Schmidt, undoubtedly a species of Stematumenia. The skeleton fibres, many of them having the central line of arenaceous and other extraneous matters, and the membranes abounding with the slender flexuous fibrillæ that characterise the genus Stematumenia.

Taguilla nigricans, Schmidt. A Hymeniacidon with spinulate spicula.

Aplysina aerophoba, Nardo. A Verongia, the keratose fibres having large central canals and the sarcodous structures being as dark and dense as those of Dr. Grant's "spongia fistulosa, which I have from the West Indies fresh as it came from the sea.

Sarcotragus spinulosus, Schmidt. A true spongia; the solid flexible fibres surrounded by an abundance of sarcode.

Tapiliata suberea ? Schmidt. A Hymeniacidon with spinulate spicula. Very closely allied to *Taguilla nigricans*, Schmidt, if not the same species.

Caminus vulcani, Schmidt; undoubtedly a pachymatisma.

Spongia nitens, a true spongia with a few extraneous spicula entangled amid its tissues.

Stegœlla saccea, Schmidt. A very delicately constructed species of Isodictya. Primary lines rarely more than bispiculous.

Cribrella hamigera, Schmidt. An Isodictya with a coarse open structure; primary lines multispiculous and numerous minute equi-anchorate spicula on the dermal membrane.

If we refer the specimens of Adriatic sponges I received from Professor Schmidt to the genera founded on anatomical principles adopted in this work,

the following would be the order in which we should have to dispose of them.

Our genus Hymeniacidon would receive the following very discrepant genera Taguilla, Tapiliata, and Suberites.

Halichondria will contain Reniera and Axinella.

Isodictya would receive Reniera, Axinella, Stegilla, and Cribrella. Desmacidon will receive a Reniera, Spongia would receive a Cacospongia, Spongelia, and Sarcotragus.

Pachymatisma will receive Stelletta, Caminus would be referable to Pachymatisma, Verongia receives Cacospongia, Gumina, and Aplysina.

With this distribution of species with, apparently, no well-defined genera to receive them, it would scarcely be possible for any student to follow Professor Schmidt's description of his species of Adriatic sponges with any probability of identifying them.

If all these numerous discrepancies in the assignment of species to genera occur in thirty-three species examined, we may well imagine the confusion that would arise from the examination of the whole of Dr. Schmidt's Adriatic species of sponges.

The great amount of discrepancy and indetermination exhibited by the comparisons of the systems of Nardo and Schmidt, with that of the arrangement in accordance with anatomical structure, renders a further description of the principles of arrangement adopted in this work necessary to the full and complete comprehension of the mode adopted to arrive at a successful determination of genera and species.

The difference of the systems of arrangement proposed by Professor O. Schmidt, and that adopted in this work is—that the genera, in the former case, are based principally on form and external characters, while in the latter they are founded purely on anatomical structure.

I have always believed that it is, not that nature

does not establish genera, but it is, that man does not always clearly comprehend them, and then wanting industry to work out the problems, he substitutes his own crude ideas in place of nature's arrangement.

It appears that a genus should always have a structural foundation by which we are at once enabled by positive and negative evidence to circumscribe our field of examination, and to arrive all the more speedily and certainly at our specific discriminations, and I am the more confirmed in this opinion, as we have many instances among the British sponges of natural genera so striking in their structural characters as to be at once recognised as such, by the most hasty observer, and amongst the most obvious examples we may name those of *Dysidea*, *Ciocalypta*, *Geodia* and *Tethea*.

The course that I have pursued in working out the species of the British sponges is just such as would be adopted by a botanist desirous of working out the specific history of a plant. The great division, whether calcareous, siliceous, or keratose, must first be determined, and this is readily and easily to be known. The genus is next to be ascertained, and as the generic characters are strictly confined to the organic structures of the skeleton and their mode of arrangement in the body of the animal, a patient examination of a section of the sponge made at right angles to its surface, and mounted in Canada balsam, seldom fails to lead to a correct determination of the genus; but it must be observed that the immersion of the slice of the sponge under examination in Canada balsam is essential to a successful result, as it is frequently the case, that the large amount of sarcode, in specimens immersed in water, renders the slender skeleton tissues nearly or entirely invisible or so indistinct as to inevitably lead to indecision or positive error, while the mounting of the specimen in Canada balsam renders the whole transparent, and enables us to discern with certainty the structural peculiarities on which the generic characters are founded. The genus being

correctly determined, and the division of the genus to which the specimen under examination being ascertained we, at once, circumscribe the field of an examination within, comparatively, a very narrow compass. The characters now called into action for specific determination are principally the spicula, a series of organs as variable in sizes, forms, and modes of combination and of disposition in the sponge, as the leaves, stipulæ, &c., are in botany, and in truth they are quite as important to specific discrimination in the sponge, as the leaves are in the plant. In some sponges we find a single form of spiculum only to prevail, but in two such closely allied species having the same form they frequently differ so greatly in their size, proportions, and mode of disposition, as to afford perfectly distinct and reliable specific characters. And here the student must be warned that Canada balsam and close examination with high powers must not be neglected, as many species, and especially so among the Geodias and Tetheas, are only to be distinctly determined by the peculiarities of form of some of the minutest of their spicula, the retentive ones. All these minute forms of spicula are as constant in their structural forms, and as reliable as specific characters as the larger forms of spicula are, and in many cases of nearly allied species in which the skeleton and defensive spicula very closely resemble each other, the retentive ones are so strikingly different as to render the discrimination of the species readily and certainly. It is frequently the case that these minute organs in a specimen immersed in water, embedded in the sarcode coating the dermal or interstitial membranes, are perfectly invisible with any amount of microscopic power, and it is only when mounted in Canada balsam that they become visible *in sitû*, but even then their minute structural peculiarities are not always to be distinctly determined; and it therefore becomes a necessary course of proceeding to ensure the success of our examination that a small portion of the sponge, includ-

ing a piece of the dermal membrane, should be boiled in nitric acid in a test tube, and carefully washed with distilled water and the spicula mounted in Canada balsam. Then the minutest of them will be rendered accurately to the eye of the student, when sufficient power is employed in the investigation, and in this operation 600 or 700 linear is frequently necessary to success. In the investigation of spicula thus mounted, a caution is necessary, as there are frequently extraneous spicula present which have either been incorporated in the substance of the sponge, or attached to its surface, and these are very liable to be mistaken for those of the species under examination. It is therefore, a good rule, never to consider a few such spicula present in the slide under consideration as belonging to the sponge, without the same forms can be detected *in situ* in the slice of the sponge mounted in Canada balsam. Other specific characters are used in the discrimination of species, but those derived from the spicula, are by far the most constant and reliable. It matters not whether the sponge be young or old, perfect, or a mere fragment, as long as these organs are present they always exhibit their normal forms and proportions and may be safely depended on in characterising either a known species or in determining a new one, as in the case of *Desmacidon incognitus* and some others. On the contrary, form, size and colour of the sponge as specific characters, excepting in a very few cases, are perfectly deceptive, and although I have myself now had nearly half a century's experience in the observation of British and exotic sponges, I frequently found myself utterly unable to determine the species of a mass of sponge put into my hands, but a slice from it placed beneath the microscope frequently, at once, solves the mystery. The student therefore, must not attempt to jump to conclusions that the nature of the subject renders morally impossible, but as a consolation, I may venture to say that with the same degree of care and steady investigation that he would exert in

the specific determination of an unknown plant, he will as certainly determine the species of the sponge, as he would the species of the plant.

Among nearly allied species of sponges, as with plants, there is frequently to be found a prominent character, an individual structure or organ that at once distinguishes it from every other, however closely allied it may be in form or colour; thus *Hymeniacidon ficus* which cannot be separated with certainty by its form, habit, or colour from *H. carnosa* or *H. suberea*, is at once discriminated by the vast number of minute inflato-cylindrical spicula in its dermal membrane. These prominent characters are rarely found in the skeleton or in any of the external characters, but they must be sought for among the auxiliary organs, and especially among the external and internal defensive spicula and the retentive ones also. All these minute organs are remarkably constant to the species, and the presence of one form only is frequently determinative of the species; in other cases the combination of two or more of these forms lead us to the same results.

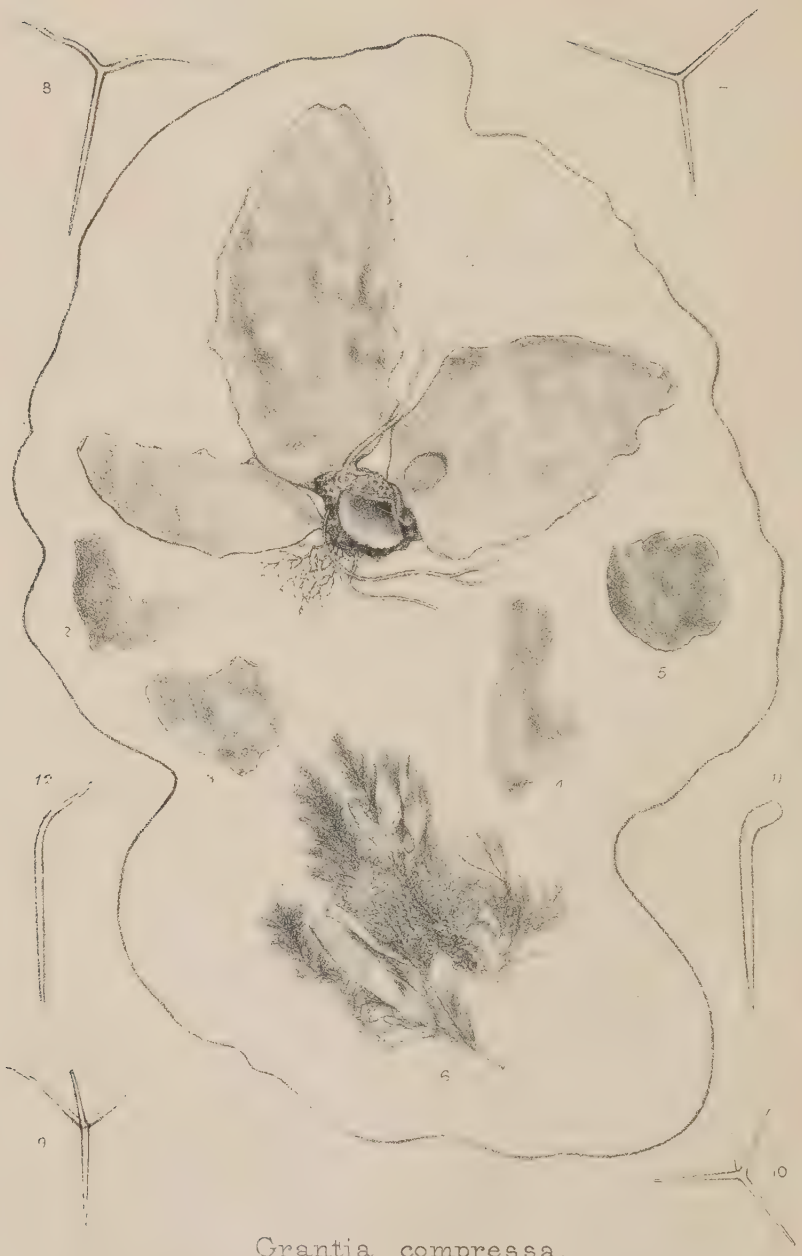
Viewing the spongiadæ as a whole they have every appearance of being a separate and especial creation, a peculiar class of creation distinct from every other living group, but combining within themselves all the strongly contrasted variety of form and structure that are so strikingly exhibited throughout the whole extent of the vegetable and the animal kingdoms. The forms and varieties of skeleton structure are as numerous and eccentric, if I may be allowed the term, as those of the whole of the higher animals; they vary in the earthy bases of their skeleton from calcareous to siliceous matter, intermixed with keratode (or cartilage) or to the possession of a keratose skeleton without the admixture of either earth, and in the auxiliary portions of their solid structure, their spicula rival the leaves of plants in the extreme variety of their forms, and yet amidst all this amazing multitude of varied forms each one can by a practised

naturalist be referred with almost certainty to the part of the sponge whence it was derived. The immense variety of forms and parts are all, as much in unison with each other, as the varied and numerous parts of plants are in the vegetable creation, or the numerous and varied forms of the bones in the higher animal creation.

In concluding, I must beg leave to return my sincere thanks to the friends who have kindly assisted me during the progress of this volume. I am deeply indebted to my friend the Rev. A. M. Norman, for the kind and liberal manner in which he has rendered me most essential service by having placed at my disposal for description and figuring, the whole of his extensive and valuable collection of British sponges. My best thanks are also due to Captain Marshall Hall, and Mr. W. Saville Kent, for having placed at my service, several rare and beautiful specimens of British sponges acquired during their cruise in the British Channel in Captain M. Hall's yacht Norna. To my friend Mr. Henry Lee, and to Mr. Parfitt of Exeter, my thanks are due for specimens of new species that are figured in this volume. To Mr. Higgin of Huyton near Liverpool, and Mr. Moore of the Free Library and Museum of Liverpool, I am indebted for much valuable information, and some new species from their neighbouring localities.

I am deeply indebted to my old friend Mr. W. Lens Aldous the artist, for the minutely faithful and beautiful representations of the British sponges, of their natural size, and of the highly magnified representations of their structural and microscopical characters. It is an astonishing fact that at the age of eighty-two, when he did the drawings on stone of Plates XCI and XCII, the work is as minutely beautiful as the earlier plates that he executed for the volume.

Plate I.



Grantia compressa.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE I.

Grantia compressa, *Fleming*.

Vol. ii, p. 17, 'Mon. Brit. Spongiadæ,' and vol. i, pl. xxi, figs. 312–314.

Fig. 1.—A group of three fine specimens from near the hard at Walton-on-the-Naze figured in the condition in which they came from the sea. Natural size.

Figs. 2, 3, 4, 5.—Varieties of form from the rocks forming the sides of the great cavern of St. Katherine's Island, Tenby, figured in the condition in which they came from the sea. Natural size.

Fig. 6.—Specimens parasitical on a fucus from the Guliot Caves, Island of Sark, from a dried specimen. Natural size.

Fig. 7.—An equiangular triradiate skeleton spiculum from the side of one of the large cells of the sponge. × 150 linear.

Fig. 8.—An elongo-equiangulated triradiate skeleton spiculum from the partial division in the middle of one of the large skeleton cells. × 150 linear.

Figs. 9 and 10.—Two of the spiculated triradiate defensive spicula from the sides of the cloaca; No. 9 with the defensive ray passing from the eye, and No. 10 with the defensive ray projected towards the eye. × 150 linear.

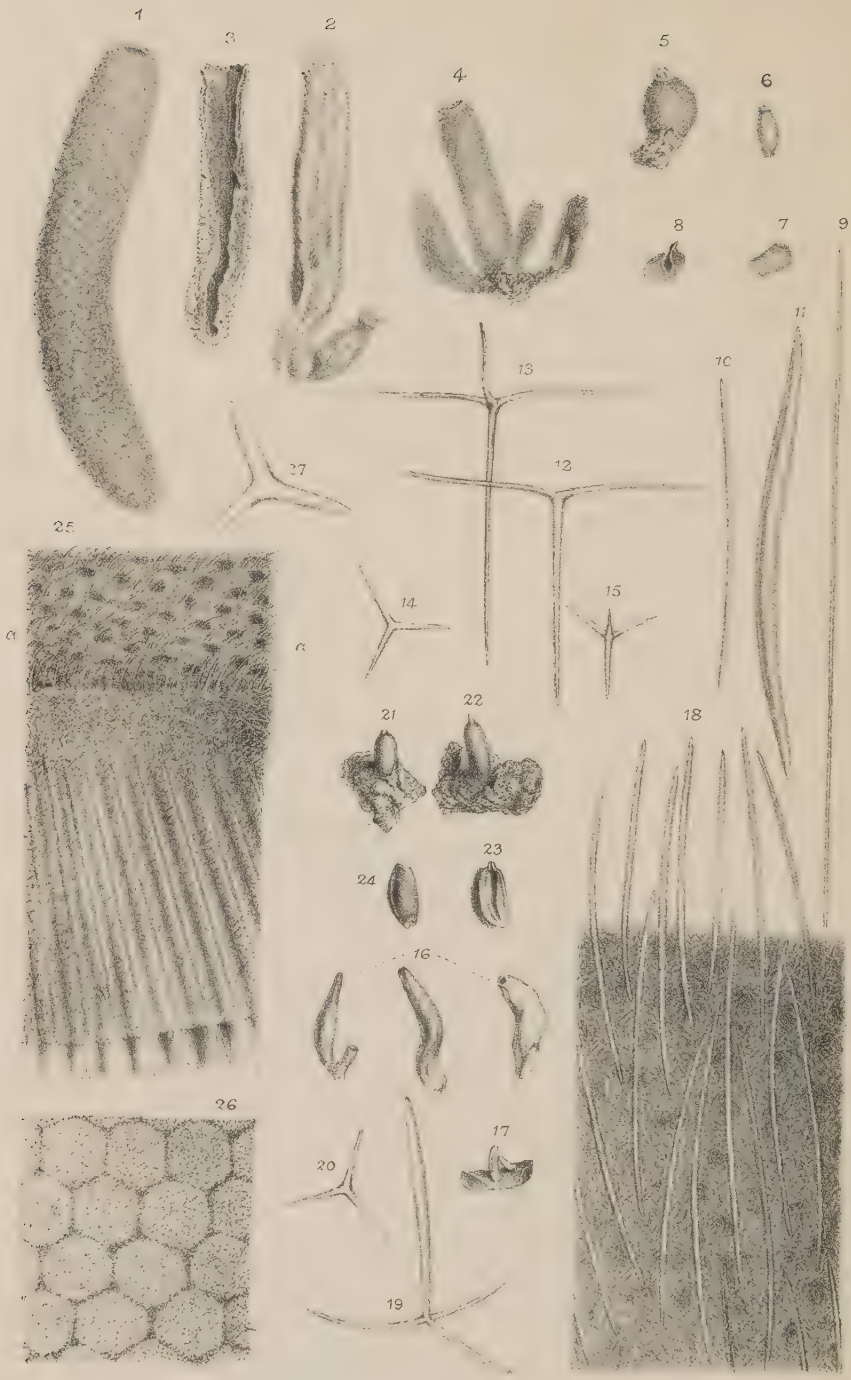
Figs. 11 and 12.—Two of the flecto-clavate external defensive spicula of the sponge; No. 11 the normal form, No. 12 an extreme variation. × 150 linear.

The sinuous line occupying a large space in the plate represents the form and size of the largest known specimen, from the River Orwell, described in page 18, vol. ii, 'Mon. Brit. Spongiadæ.'

The foliated forms of this species are well represented in Dr. Johnson's 'History of the British Sponges,' plate xx, fig. 1.

In the 'Transactions' of the Microscopical Society, vol iii, illustrating my paper "On the Ciliary Action in the Spongiadæ," there is figured on plate ix, fig. 1, a section of a small specimen of *G. compressa* at right angles to the axis of the sponge exhibiting the ciliated cells *in sitú;* and fig. 2 in the same plate represents a portion of the inner surface of the sponge; the central group of three diaphragms (*a*) exhibits the appearance of the cilia when slowly in motion within the diaphragm. Fig. 3 represents detached tessellated cells, and fig. 4 detached tessellated cells and cilia.

Plate II.



Grantia ciliata 1–15. G. ensata 16 20.
G tessellata 21.–27.

Jens Aldous del. et lith. ad nat

W. West & C° imp.

PLATE II.

Grantia ciliata, *Fleming*.

Vol. ii, p. 19, 'Mon. Brit. Spongiadæ.'

Fig. 1.—A large-sized specimen from the River Orwell, figured of the natural size, and in the condition in which it came from its natural locality, having been preserved in a saturated solution of salt and water.

Fig. 2.—A large-sized specimen, with a small one at its base, from the same locality as No. 1, figured of the natural size in the dried condition.

Fig. 3—A longitudinal section of a large-sized dried specimen from the River Orwell, showing the origin of the cloacal cavity at the proximal end of the sponge, and its gradual expansion until it reaches its distal extremity. Natural size.

Fig. 4.—A group of specimens of about the usual size of the species figured in the condition in which they came from the sea at Plymouth, of the natural size.

Figs. 5, 6.—Short varieties of the sponge, of the natural size and in the dried state, from Guernsey, by the late Mrs. Buckland; 5 with the excurrent orifice expanded, No. 6 with the orifice contracted.

Fig. 7.—A nearly spherical specimen, of the natural size in the dried state, from Guernsey, by Mrs. Buckland.

Fig. 8.—A longitudinal section of the sponge, represented by fig. 7, exhibiting the cloacal cavity and the spicula of the excurrent orifice. Natural size.

Fig. 9.—A portion of a long attenuated-acerate

spiculum from the ciliary fringe of the mouth of the cloaca. × 80 linear.

Fig. 10.—An acerate spiculum, from the defensive cone of the inhalent system. × 80 linear.

Fig. 11.—One of the large fusiformi-acerate spicula supporting the base of the ciliary fringe of the mouth of the cloaca. × 80 linear.

Fig. 12.—A rectangulated triradiate spiculum, from near the base of the ciliary fringe of the mouth of the cloaca. × 80 linear.

Fig. 13.—A spiculated, rectangulated, triradiate, defensive spiculum from the base of the ciliary fringe of the cloaca. × 80 linear.

Fig. 14.—An equiangular triradiate spiculum of the skeleton. × 80 linear.

Fig. 15.—A spiculated, equiangular, triradiate, defensive spiculum from the interior surface of the cloaca. × 80 linear.

Grantia ensata, *Bowerbank*.

Vol. ii, p. 25, 'Mon. Brit. Spongiadæ.'

Fig. 16.—Representations of three specimens of *G. ensata*. Natural size.

Fig. 17.—Two young specimens of the same species based on a fragment of shell. Natural size.

Fig. 18.—A portion of the surface of one of the specimens of *G. ensata* exhibiting the mode of disposition in the direction of the long axis of the sponge, of the large fusiformi-acerate defensive spicula. × 50 linear.

Fig. 19.—One of the spiculated, equiangular, triradiate internal, defensive spicula from the cloaca of *G. ensata*, the spicular ray being very long and ensiform. × 80 linear.

Fig. 20.—Represents one of the equiangular triradiate skeleton spicula of *G. ensata*. × 80 linear.

Grantia tessellata, *Bowerbank.*

Vol. ii, p. 26, 'Mon. Brit. Spongiadæ.'

Figs. 21, 22.—Represent two specimens of *G. tessellata* based on fragments of shells. Natural size.

Fig. 23.—Represents a longitudinal section of *G. tessellata* exhibiting the compact disposition of the cells of the skeleton and the length and form of the cloacal cavity. Natural size.

Fig. 24.—A view of the external surface of the corresponding half of the sponge represented by fig. 23. Natural size.

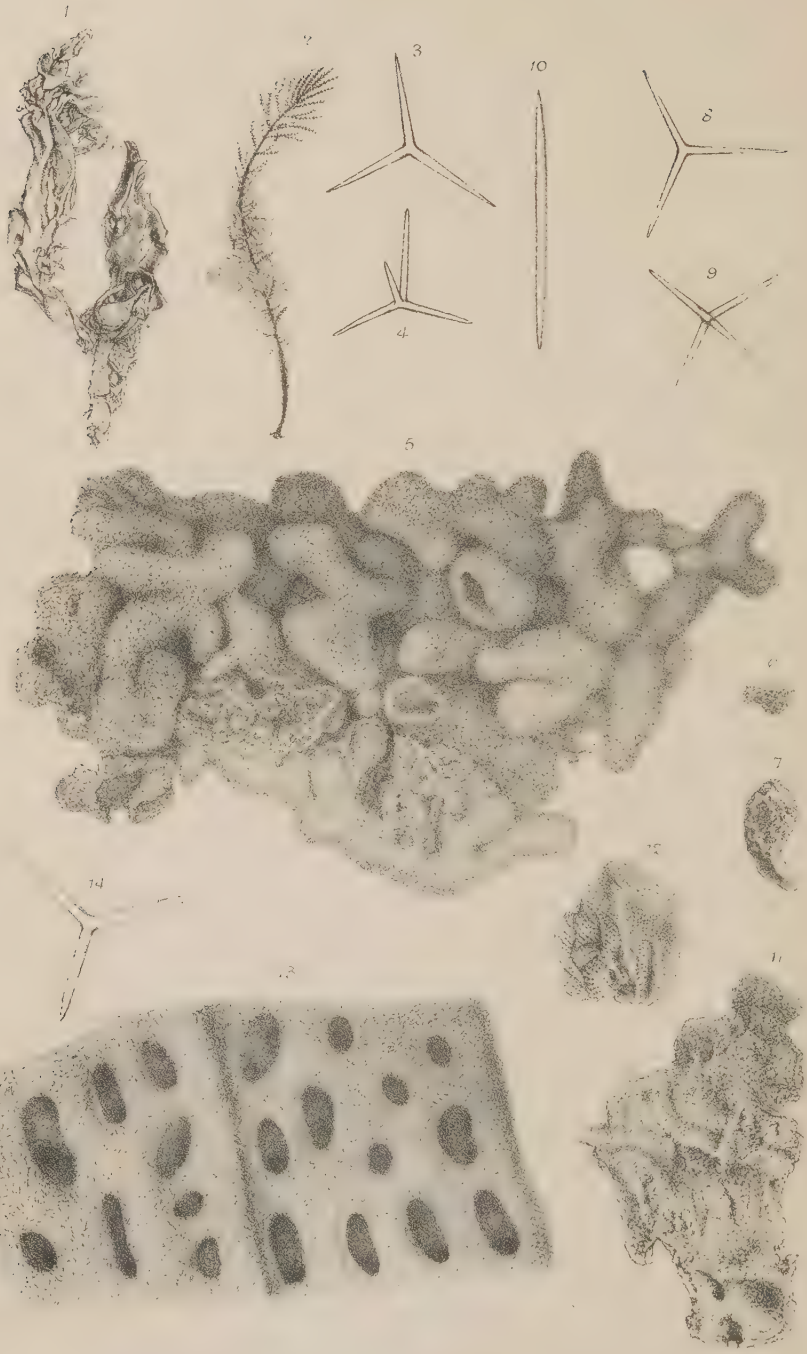
Fig. 25.—A magnified view of a portion of the internal surface of the specimen represented by fig. 23, exhibiting a portion of the oscular areas opening into the cloaca at (*a*); the form, structure, and arrangement of the cells of the skeleton, and the compact corymbose bundles of small acerate defensive spicula of the external surface of the sponge. × 50 linear.

Fig. 26.—A magnified view of a portion of the external surface of the specimen represented by fig. 24, exhibiting the tessellated appearance produced by the compact disposition of the corymbose bundles of the minute acerate external defensive spicula. × 80 linear.

Fig. 27.—One of the stout equiangular triradiate spicula of the skeleton. × 123 linear.

In vol. i, Plate XVII, fig. 286, 'Mon. Brit. Spongiadæ,' there is represented a portion of the inner surface of the cloaca of *G. tessellata*, showing the form and mode of disposition of the ensiform, spiculated, equiangular, triradiate, internal, defensive spicula, and their curvature towards the mouth of the cloaca. × 108 linear.

Plate III.



Leucosolenia botryoides 1–4. L. contorta 5–10.
L. coriacea 11–14.

W. Lens Aldous del. et lith. ad. nat

W. West & Co. imp

PLATE III.

Leucosolenia botryoides, *Bowerbank.*

Vol. ii, p. 28, 'Mon. Brit. Spongiadæ,' and vol. i, pl. xxvi, figs. 347–348.

Fig. 1.—A specimen of *L. botryoides* from Shetland, in which the fistulæ are much more developed than is usual with the species. Natural size.

Fig. 2.—A specimen of *L. botryoides* parasitic on a slender fucus, in which the fistulæ are small and scattered along the stem. This form is the usual one under such circumstances. Natural size.

Fig. 3.—One of the equiangular triradiate spicula of the skeleton of *L. botryoides*. ×150 linear.

Fig. 4.—One of the spiculated, equiangular, triradiate, internal, defensive, spicula of *L. botryoides*. × 150 linear.

Vol. i, Plate XXVI, fig. 348, represents the fistulæ clustered in a group, as they are frequently found in Weymouth Bay and at Tenby. Natural size. Fig. 347 in the same plate represents two of the fistulæ. × 50 linear.

Leucosolenia contorta, *Bowerbank.*

Vol. ii, p. 29, 'Mon. Brit. Spongiadæ.'

Fig. 5.—A small specimen of *L. contorta* from Guernsey, magnified to illustrate the contort arrangement of the fistulæ. × 150 linear.

Fig. 6.—The specimen represented by fig. 5. Natural size.

Fig. 7 represents one of the largest specimens of *L. contorta* that I have yet seen. Natural size.

Fig. 8.—One of the slender, equiangular, triradiate, internal, defensive spicula of the skeleton of *L. contorta*. × 150 linear.

Fig. 9.—One of the spiculated, equiangular, triradiate, internal, defensive spicula of *L. contorta*. × 150 linear.

Fig. 10.—One of the procumbent, acerate, spicula of the exterior surface of *L. contorta*. × 150 linear.

Leucosolenia coriacea, *Bowerbank*.

Vol. ii, p. 34, 'Mon. Brit. Spongiadæ.'

Fig. 11.—A specimen of *L. coriacea* from the Guliot Caves, Sark. Natural size.

Fig. 12.—A second specimen of *L. coriacea* from the Guliot Caves, exhibiting the tortuous fistulæ of the sponge. Natural size.

Fig. 13.—A magnified view of a portion of the surface of the specimen represented by fig. 12. × 12 linear.

Fig. 14.—One of the skeleton spicula of *L. coriacea*. × 123 linear.

After the plate containing the illustration of *L. coriacea* was printed, I found a specimen of that sponge preserved in spirit with several other small specimens from Shetland, which were sent to me for examination by the Rev. A. M. Norman. On examining it microscopically I found it contained an abundance of gemmules. They were exceedingly numerous on the inner surface of the dermal membrane. Their form was either spherical or slightly oval; they were of a nut-brown colour, and filled with numerous spherical molecules, which were distinctly visible with a power of 700 linear. One of the largest of the gemmules measured $\frac{1}{1119}$ inch in diameter, and the molecules within it did not exceed $\frac{1}{15000}$ inch in diameter. This gemmule had all the appearance of being in a fully developed condition. The greater portion of the other gemmules were much smaller; one of about the average size measured $\frac{1}{1765}$ inch in diameter.

Plate IV.

Leucosolenia lacunosa.

W. Lens Aldous del. et lith. ad nat.

W. West & Co. imp.

PLATE IV.

Leucosolenia lacunosa, *Bowerbank.*

Vol. ii, p. 32, ‘Mon. Brit. Spongiadæ.’

Fig. 1. — A magnified view of a fine specimen of *L. lacunosa* from deep water at the Turbot Bank, Belfast, preserved in spirit in the condition in which it came from the sea by Mr. George Hyndman, of Belfast, exhibiting the rotund form of the sponge, and the tortuous mode of disposition of the fistulæ. × 12 linear.

Fig. 2.—The same sponge. Natural size.

Fig. 3.—A small specimen of the same species, and of the same form, as that represented by figs. 1, 2 from deep water off Larne, near Belfast, dredged by Mr. G. Hyndman, and preserved in spirit in the state in which it came from the sea. Natural size.

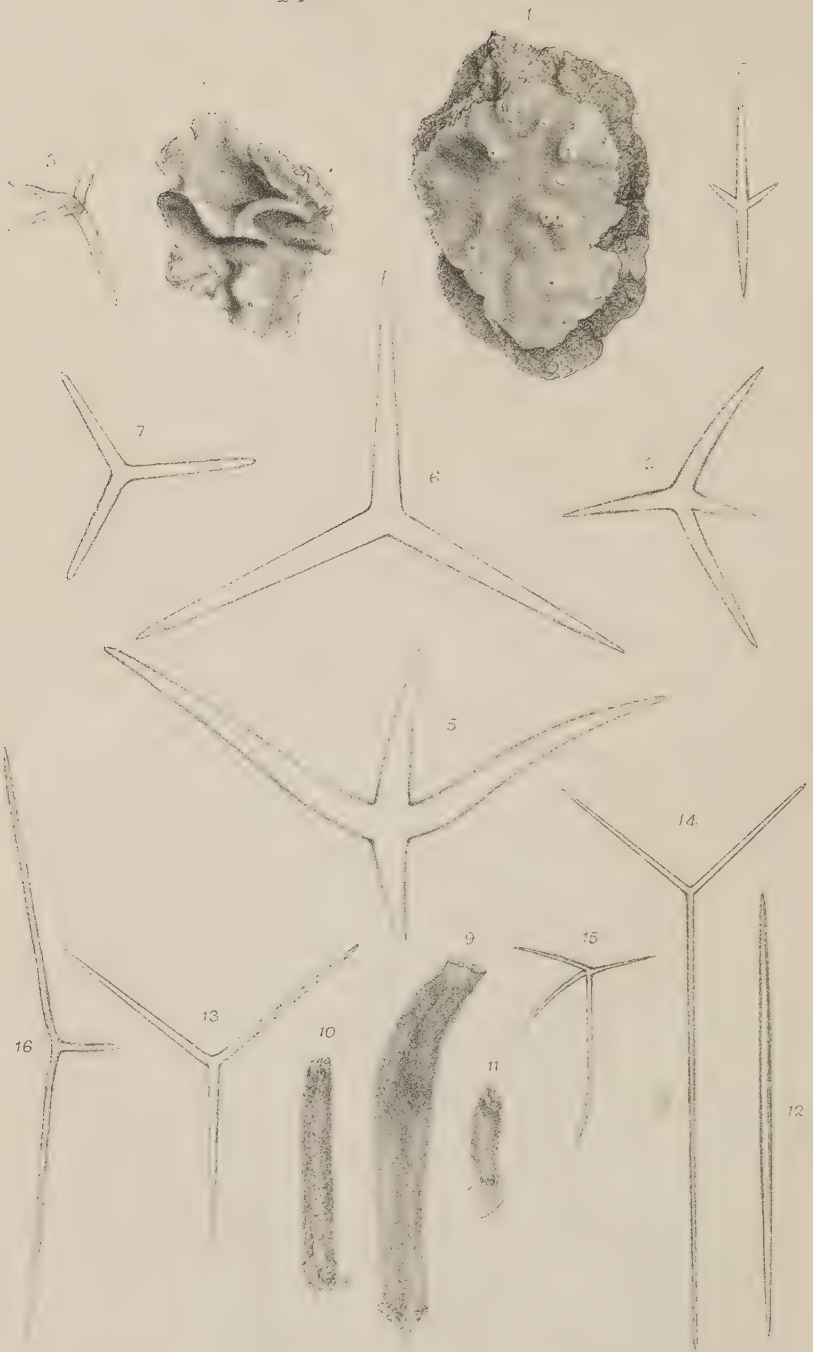
Fig. 4.—A compressed specimen of *L. lacunosa* from Scarborough, by Mr. Bean. It is remarkable from the breadth of its body being much greater than its height. Natural size.

Fig. 5 represents a portion of one of the fistulæ of a specimen mounted in Canada balsam, exhibiting the mode of the disposition of the equiangular, triradiate, skeleton spicula, the more or less elongation of the ray of the spiculum parallel to the long axis of the fistula. × 123 linear.

Figs. 6, 7.—Two of the skeleton spicula from the surface of the portion of the specimen represented by fig. 5. × 123 linear.

Fig. 8.—One of the acerate spicula from near the base of the body of the sponge. × 123 linear.

This species is figured by Dr. Johnston in his ‘History of British Sponges,’ plate xx, figs. 2, 3.



Leuconia nivea 1–8. L. fistulosa 9–16.

W.Lens Aldous del et lith. ad nat

W. West & Co imp

PLATE V.

Leuconia nivea, *Grant.*

Vol. ii, p. 36, 'Mon. Brit. Spongiadæ;' vol. i, pl. xxviii, figs. 351, 352.

The external characters of this species vary to a very considerable extent in different localities. Exposed to the full action of the sea on the under surfaces of thin ledges of rock, as at the neighbourhood of Scarborough, it appears as a thin coating sponge, with the orifices of the cloacæ scarcely elevated above the common surface of the sponge, as represented by fig. 1, of the natural size, in the present volume. In more sheltered situations it has still more or less of a coating form, but is furnished with a series of irregular ridges or crests, on which the excurrent orifices of the cloacæ are situated, as represented by fig. 2, Plate V, of the present volume, of the natural size. In caves or other well-sheltered localities it assumes the form of congregated lobular masses, as represented by fig. 352, vol. i, 'Mon. Brit. Spongiadæ,' of the natural size, and by fig. 351 in the same plate, which represents a longitudinal section of one of the mammæ form, portions exhibiting one of the cloacal cavities of the sponge and its internal defensive spicula. × 50 linear.

Figs. 3, 4, 5 represent the large, stout, equiangular, spiculated, triradiate, internal, defensive spicula. × 80 linear. The basal radii of fig. 5 are projected backward in tripodal fashion. Very minute specimens of this form are also found in the lining membrane of the cloaca, one of which, × 660 linear, is represented by fig. 89, plate iv, vol. i, 'Mon. Brit. Spongiadæ.'

Figs. 6, 7 represent two of the equiangular, triradiate, skeleton spicula. × 80 linear.

Fig. 8.—One of the unicurvo-cruciform, tension

spicula of the lining membrane of the cloaca. × 130 linear.

Leuconia fistulosa, *Bowerbank.*

Vol. ii, p. 39, 'Mon. Brit. Spongiadæ.'

Fig. 9.—A specimen of *L. fistulosa* from Plymouth. Natural size. Dried specimen.

Figs. 10, 11.—Two specimens of *L. fistulosa* from off Saints' Bay, Guernsey. Natural size. Dredged by the Rev. A. M. Norman. From dried specimens.

Fig. 12.—One of the large fusiformi-acerate, external, defensive spicula. × 80 linear.

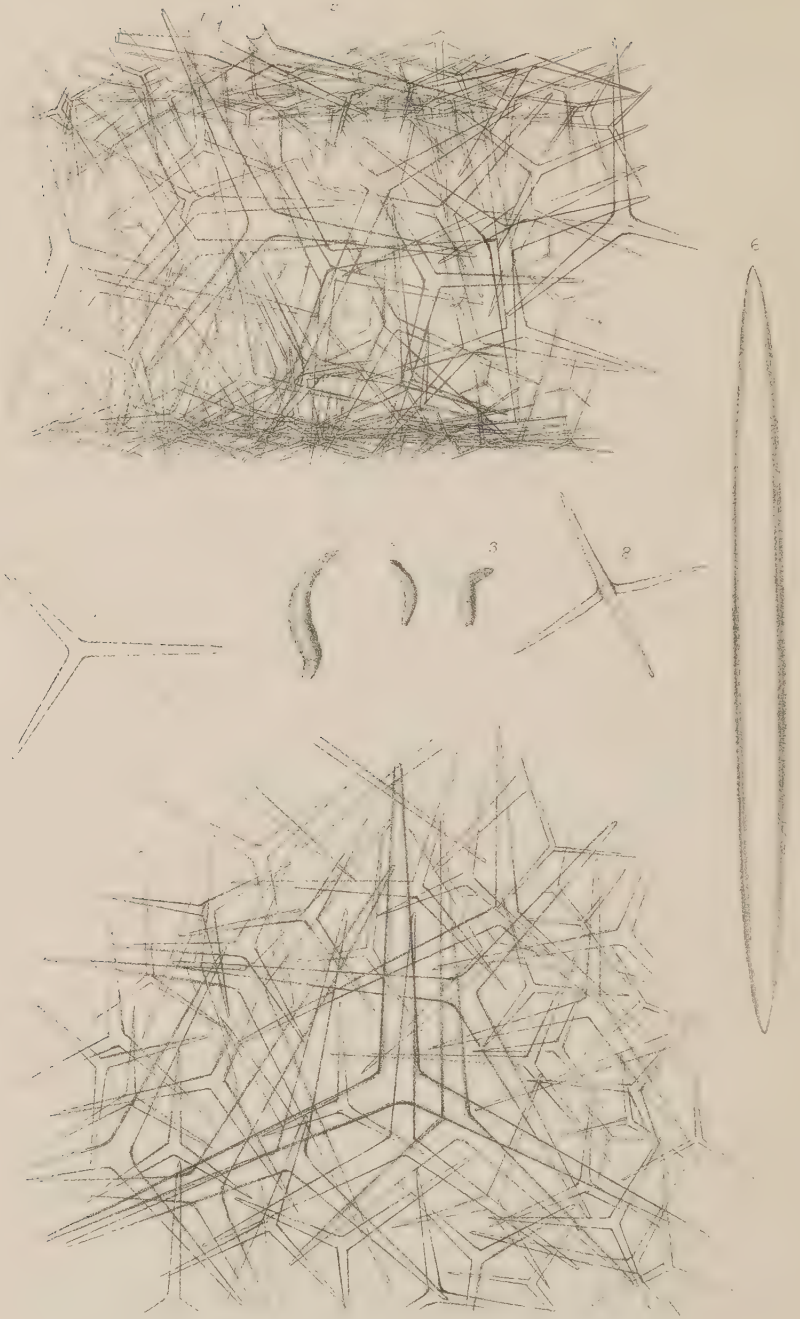
Fig. 13.—An equiangular, triradiate, skeleton spiculum of the normal form. × 123 linear.

Fig. 14.—An equiangular, triradiate, skeleton spiculum of an abnormal form. × 123 linear. The elongation of the third ray is variable, and usually in the direction of the long axis of the sponge.

Fig. 15.—One of the spiculated, equiangular, triradiate, internal, defensive spicula. × 123 linear. The spicular ray is in the downward direction.

Fig. 16.—One of the slender, rectangulated, triradiate spicula. × 123 linear, from near the mouth of the cloacal cavity.

Plate VI.



Leuconia pumila 1–5. Leucogypsia Gossei 6–8.

W. Lens Aldous del. et lith. ad nat. W. West & Co. imp.

PLATE VI.

Leuconia pumila, *Bowerbank.*

Vol. ii, p. 41, 'Mon. Brit. Spongiadæ.'

Figs. 1, 2, 3.—*Leuconia pumila.* Natural size.

Fig. 4 represents a portion of the surface of a specimen of *Leuconia pumila* exhibiting the great variety in the size of the skeleton spicula, the space between the extreme points of the largest triradiate spiculum being very little short of that of the diameter of the sponge. × 80 linear.

Fig. 5.—A portion of a longitudinal section of *L. pumila* representing a space extending from the external surface of the sponge to the surface of the cloacal cavity, and the mode of the disposition of the skeleton spicula (*a*) being the external surface. × 80 linear.

Leucogypsia Gossei, *Bowerbank.*

Vol. ii, p. 42, 'Mon. Brit. Spongiadæ.'

Vol. ii, plate xxvi, fig. 350, represents a very characteristic specimen of *L. Gossei* of the natural size.

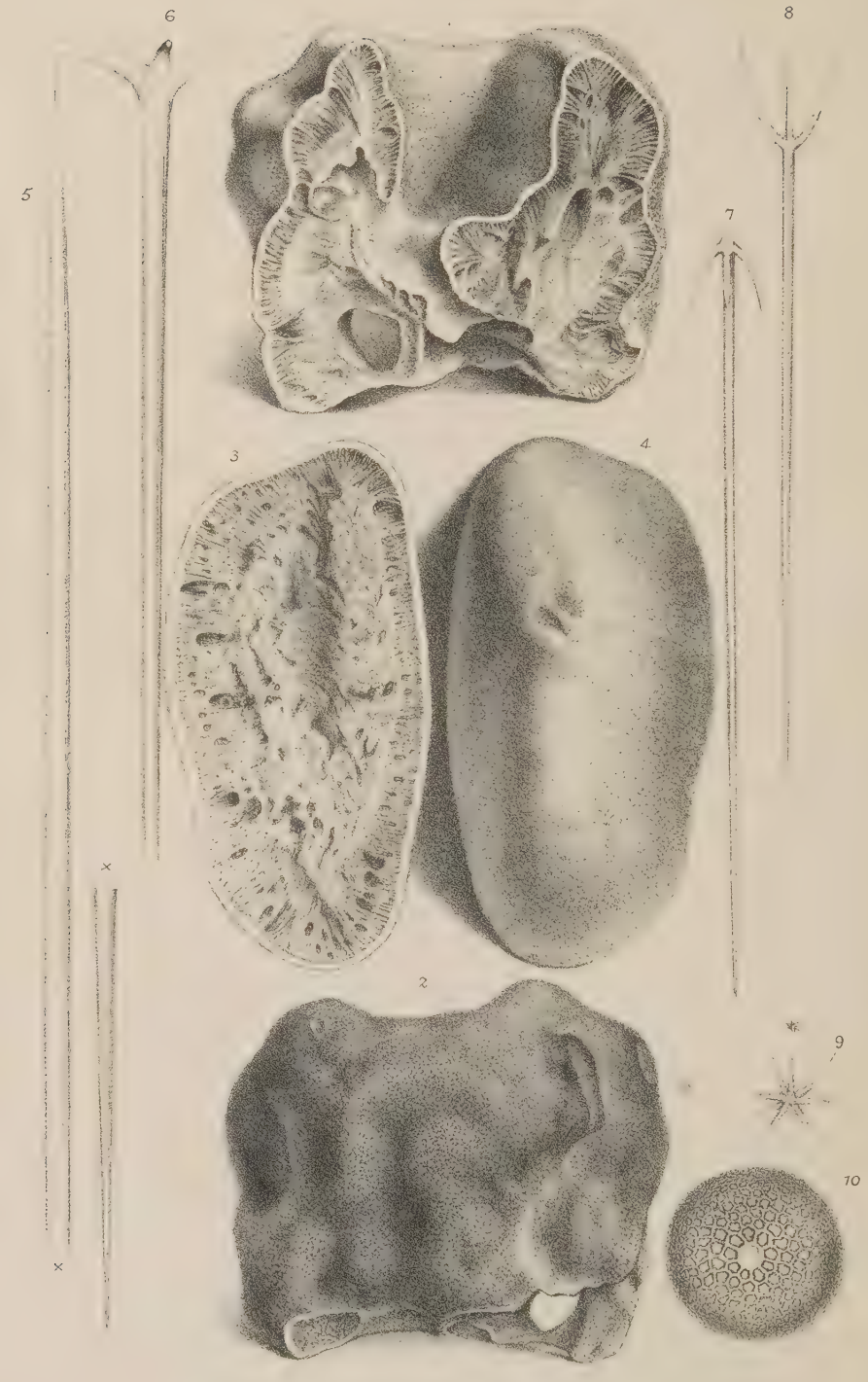
Fig. 349, in the same plate, represents a section at right-angles to the surface of the sponge, exhibiting the irregular interstitial structure, with the large fusiformi-acerate spicula, disposed at various angles to the surface. × 50 linear.

Fig. 6, vol. iii.—One of the large fusiformi-acerate spicula. × 123 linear to show the size as compared with the other spicula of the sponge.

Fig. 7.—One of the equiangulated, triradiate spicula of the skeleton. × 123 linear.

Fig. 8.—A spiculated, equiangulated, triradiate, internal, defensive spiculum. × 123 linear.

Plate VII.



Geodia Zetlandica.

W. Lens Aldous del. et lith. ad nat.

W West & Co imp

PLATE VII.

Geodia Zetlandica, *Johnston*.

Vol. ii, p. 45, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Sectional view of the type-specimen (*Cydonium Mulleri*, Fleming) exhibiting the radiated structure of the specimen. Natural size.

Fig. 2.—View of the external surface of the same specimen. Natural size.

Fig. 3.—A sectional view of the specimen of the same species of sponge which I received from Mr. J. de C. Sowerby. Natural size.

Fig. 4.—View of the external surface of the same sponge as No. 3. Natural size.

Fig. 5.—One of the fusiformi-acerate skeleton spicula from the type-specimen. × 80 linear.

Fig. 6.—One of the attenuato-patento-ternate, connecting spicula from the type-specimen. × 80 linear.

Fig. 7.—An attenuato-recurvo-ternate spiculum from the type-specimen. × 80 linear.

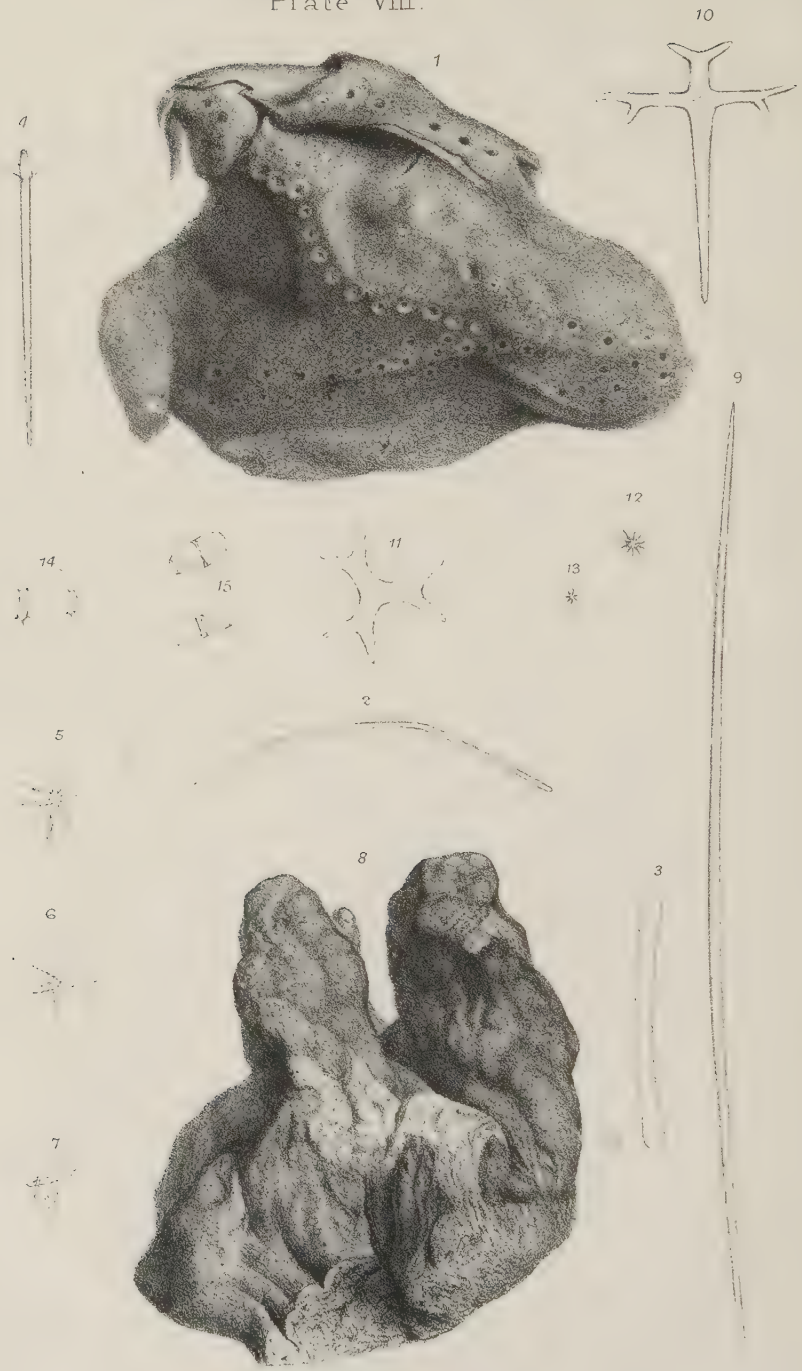
Fig. 8.—A porrecto-ternate spiculum from the type-specimen. × 80 linear.

Fig. 9.—A large and a small attenuato-stellate spiculum from the interstitial membranes of the type-specimen. × 250 linear.

Fig. 10.—A fully-developed ovarium from the type-specimen, with the foramen in its centre. × 250 linear.

Through the kind intervention of my friend Dr. McBane, of Edinburgh, I have been favoured with the loan of the highly interesting and valuable type-specimen of *Geodia Zetlandica*, Johnston, by Dr. Andrew Fleming, of Seagrove, son of the late eminent Professor Fleming, of Edinburgh, to whom I am much indebted for the opportunity of figuring a specimen regarding which there has been so much discussion. No other specimens of this interesting species than the two figured have yet been found in any collection of British sponges.

Plate VIII.



Pachymatisma Johnstonia 1–7.
Ecionemia ponderosa 8–15.

W. Lens Aldous del. et lith. ad nat.

W. West & Co. imp.

PLATE VIII.

PACHYMATISMA JOHNSTONIA, *Bowerbank.*

Vol. ii, p. 51, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen of *P. Johnstonia* in the state in which it came from the sea, having been preserved in spirit. Natural size. A portion of the oscula are more or less open, while others are in a closed condition.

Figs. 2, 3.—Two of the numerous varieties of form and size of the skeleton spicula. × 80 linear.

Fig. 4.—One of the connecting spicula. × 80 linear. These spicula are very variable in form and proportions.

Figs. 5, 6.—Two of the incipiently-spinous attenuato-stellate, retentive spicula. × 250 linear. Showing the variations in the size and number of their radii.

Fig. 7.—A group of tuberculated fusiformi-cylindrical, retentive spicula. × 250 linear.

This sponge afforded me a considerable number of type forms of spicula to illustrate vol. i, treating on the 'Anatomy and Physiology of the Spongiadæ.' I must, therefore, refer the student to those figures for the more complete illustration of the anatomy of this very interesting specimen.

Vol. i, plate xxvii, fig. 353, represents a section of *P. Johnstonia* at right angles to the surface exhibiting the irregularity of the skeleton structure directly beneath the dermal crust. × 50 linear.

In plate xxiv, figs. 330, 331, 332 in the same volume there are figures of the ovaria in progressive stages of development.

In plate i, figs. 15, 17, 20, and 21 represent varieties in form of the skeleton spicula.

In plate ii, figs. 45 and 46 represent varieties of form of the connecting spicula.

In plate vi, figs. 158 and 159, the stellate retentive spicula are represented, with a power of 660 linear.

Plate iv, fig. 93, represents one of the tuberculated, fusiformi-cylindrical retentive spicula. × 660 linear.

Ecionemia ponderosa, *Bowerbank.*

Vol. ii, p. 56, 'Mon. Brit. Spongiadæ.'

Fig. 8.—*E. ponderosa*, in the dried state, from the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 9.—One of the skeleton spicula of *E. ponderosa*. × 80 linear.

Fig. 10.—One of the furcated attenuato-expando-ternate connecting spicula. × 80 linear.

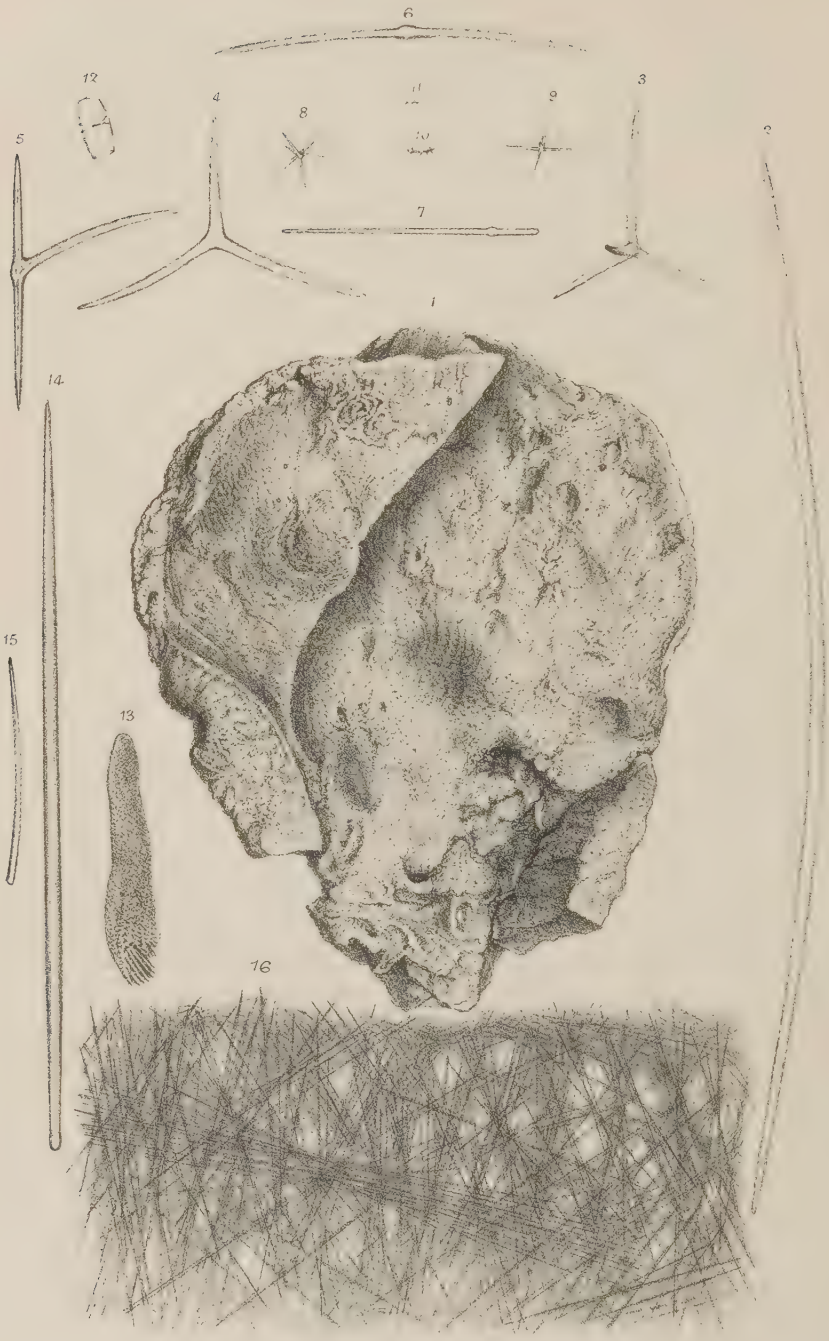
Fig. 11.—A direct view of the apex of one of the same spicula, showing the broad and strong proportions of its structure. × 80 linear.

Figs. 12, 13.—Two of the small attenuato-stellate, retentive spicula. × 666 linear. These spicula vary to a very considerable extent in size.

Fig. 14.—Two of the minute, elongo-stellate, retentive spicula. × 666 linear. These spicula are also very variable in size.

Fig. 15.—Two of the doliolate, cylindrical spicula. × 123 linear.

Plate IX.



Ecionemia compressa 1–12. Polymastia ornata 13–16.

W. Lens Aldous del. et lith. ad nat

W. West & C° imp.

PLATE IX.

ECIONEMIA COMPRESSA, *Bowerbank.*

Vol. ii, p. 55, 'Mon. Brit. Spongiadæ.'

Fig. 1.—The type-specimen of *E. compressa.* Natural size.

Fig. 2.—One of the skeleton spicula. × 80 linear.

Fig. 3.—An attenuato-patento-ternate, connecting spiculum of the normal form. × 80 linear.

Figs. 4, 5.—Two abnormal forms of the connecting spicula. × 80 linear.

Fig. 6.—One of the inflato-acerate, incipiently-spined, tension spicula. × 250 linear.

Fig. 7.—An inflato-acerate, incipiently-spined, tension spiculum. × 250 linear. This form is of comparatively rare occurrence.

Figs. 8, 9.—Two of the largest attenuato-stellate, retentive spicula, showing the variety that occurs in the number of their radii. × 250 linear.

Figs. 10, 11.—Two of the minute, elongo-attenuato-stellate, retentive spicula, showing the variation in their size. × 250 linear.

Fig. 12.—A doliolate, cylindrical, retentive spiculum. × 250 linear.

During a searching examination of the spicula for figuring I found a few doliolate spicula very similar to those in *E. ponderosa.* One of these I have figured, and we must, therefore, add to the specific character of the species under consideration in the description of the spicula of the interstitial membranes "and doliolate cylindrical spicula, few in number."

Polymastia ornata, *Bowerbank.*

Vol. ii, p. 58, 'Mon. Brit. Spongiadæ.'

Fig. 13.—*P. ornata.* The type-specimen natural size. A portion of the proximal end of the sponge has been torn off, exhibiting an interior view of the primary fasciculi of the skeleton and their spiral mode of arrangement.

Fig. 14.—One of the large acerate spicula of the primary lines of the skeleton. × 23 linear.

Fig. 15.—One of the short, stout, acerate, external, defensive spicula. × 123 linear.

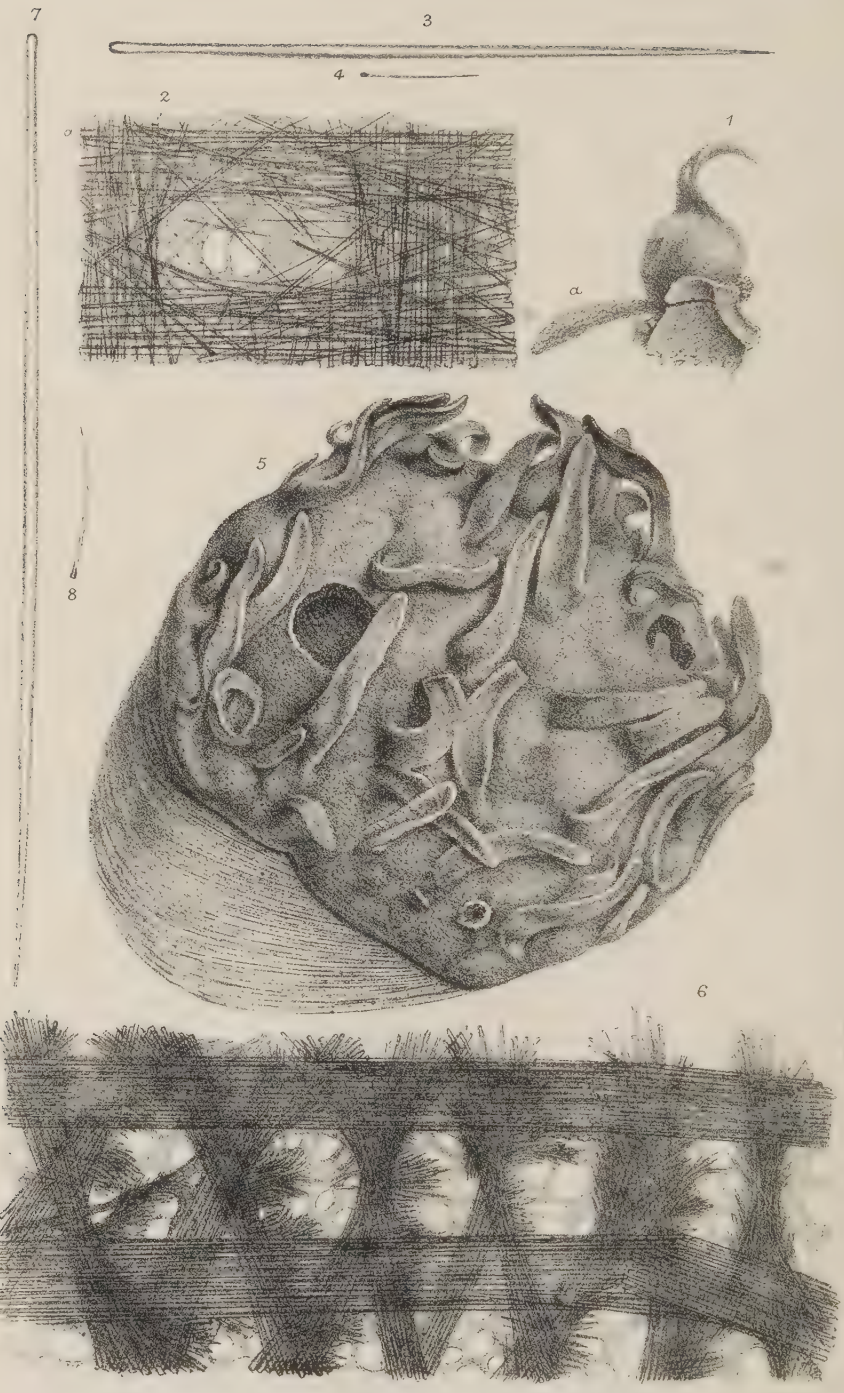
Fig. 16.—A portion of the distal termination of a specimen of *P. ornata*, sent to me by the late Mr. Barlee. × 36 linear. This specimen exhibits the excurrent orifices of the cloaca of the sponge under consideration in a very satisfactory manner, and it also forms an excellent illustration of the general form and arrangement of the tissues in the excurrent organs of this genus of sponges.

The terminal excurrent orifices of the fistulæ in *Polymastia* are precisely similar to the corresponding organs in Alcyoncellum, but they differ in the nature of the structure of the reticulation surrounding each of them. In the latter genus it is always composed of more or less solid siliceous fibre; in the former it is always formed of interlacing fasciculi of spicula. The design of the skeleton structure is the same in both genera, but the modes in which it is carried out are different, and the same modifications of the structural materials exist in all parts of the skeleton structures of the various species of the two genera.

There is also another distinctive character of great value in the separation of the two genera, and that is the total absence in Polymastia of the numerous, large, stout, rectangulated, hexradiate, interstitial spicula that are so abundant in Alcyoncellum around every one of the inhalent areas of that sponge.

In all the species I have described the pores have been designated as "inconspicuous," and in many of the specimens first examined they were in a closed state and not amenable to the power applied to them.

In several of the specimens subsequently acquired and examined I have found them in an open condition as represented by fig. 6, Plate X, in *P. robusta*, and also in *P. bulbosa*, fig. 2, in the same plate. In a specimen of *P. brevis* mounted in Canada balsam they are also rather indistinctly visible. In all these cases they are congregated above the porous areas of the parietes of the fistulæ, and they do not appear to exist on any other portion of those bodies. It will therefore be advisable for the future to consider this arrangement of the pores as the correct description of those organs to be added to the specific descriptions of the species recorded in vol. ii, 'Mon. Brit. Spongiadæ.'



Polymastia bulbosa 1–4. P. robusta 5–8.

W. Lens Aldous del. et lith. ad. nat.

W. West & Co imp.

PLATE X.

Polymastia bulbosa, *Bowerbank*.

Vol. ii, p. 61, 'Mon. Brit. Spongiadæ.'

Fig. 1.—The type-specimen of *P. bulbosa* from the wet preparation, and of the natural size. (*a*) A young specimen of Dictyocylindrus growing from near the base of *P. bulbosa* on the same fragment of shell.

Fig. 2.—Represents a small portion of the bulbous body of the sponge exhibiting one of the porous areas with two open pores, and a small portion of one of the large primary fasciculi of the skeleton at (*a*). × 80 linear.

Fig. 3.—One of the large fusiformi-acerate spicula of the skeleton. × 150 linear.

Fig. 4.—One of the minute spinulate, external, defensive spicula. × 150 linear.

Polymastia robusta.

Vol. ii, p. 62, 'Mon. Brit. Spongiadæ.'

Fig. 5.—*P. robusta* of the natural size from the dried specimen presented to me by Prof. William King, of Queen's College, Galway.

Fig. 6.—A view of a portion of the inner surface of the great cloacal cavity of a specimen of *P. robusta* dredged by the Rev. A. M. Norman off the coast of Northumberland. The specimen is mounted in Canada balsam. It exhibits in a very satisfactory manner portions of two of the primary skeleton fasciculi, with

the transverse interlacing secondary parts of the skeleton, in the intervals between which are seen the pores in an open state, congregated in the porous areas of the dermal membrane. × 150 linear.

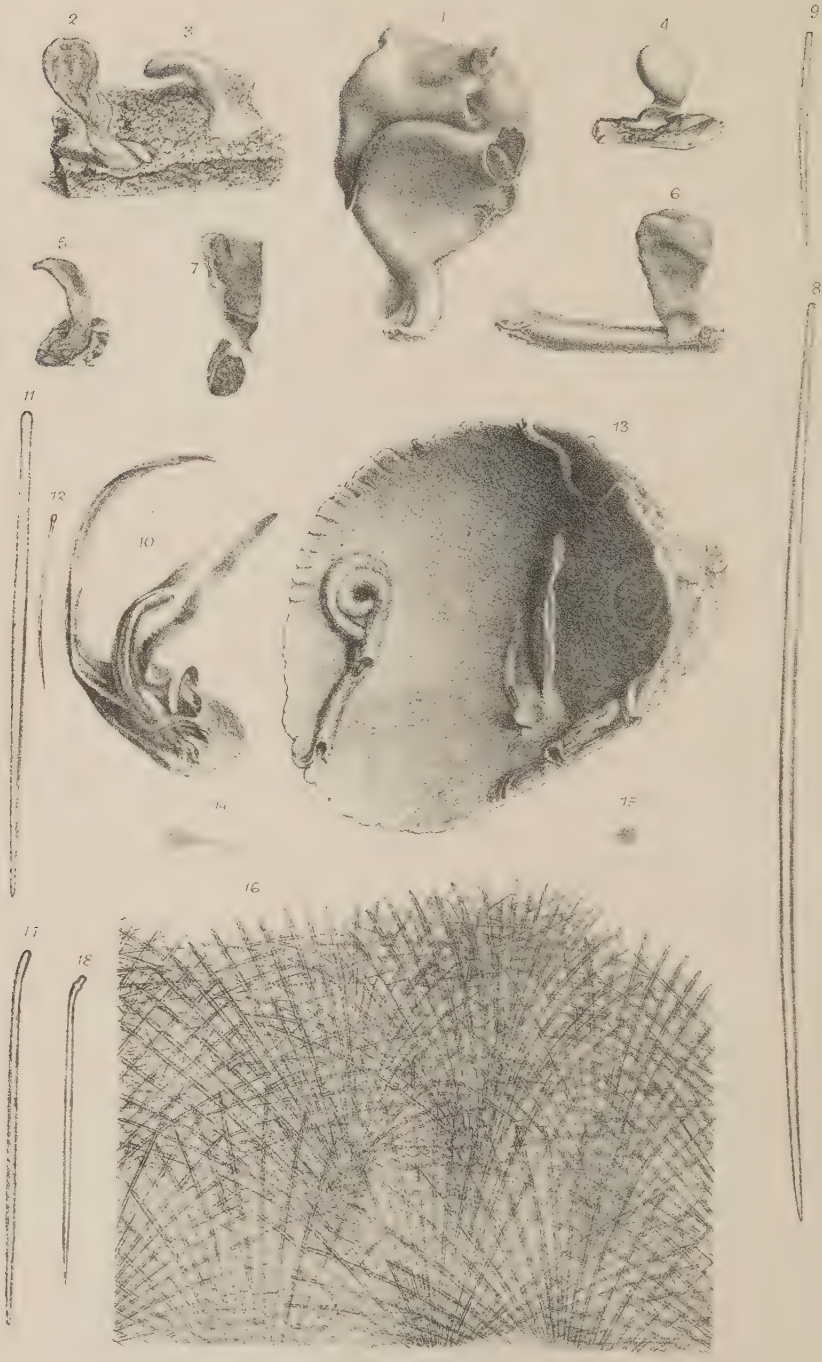
This specimen, in conjunction with that from the distal end of the cloaca of *P. ornata*, Plate IX, fig. 16, exhibiting the nature and structure of the excurrent organs, afford us a most satisfactory view of the mode of the general structure of the sponges of this interesting genus.

Fig. 7.—One of the large superfusiformi-acuate, skeleton spicula. × 80 linear.

Fig. 8.—One of the spinulate, external, defensive spicula. × 150 linear.

The porous areas of *P. bulbosa* are somewhat different from those of *P. robusta*. The dermal membrane is much more delicate in its structure, and the number of pores in each are less. Those represented by fig. 2 are from the bulbous portion of the sponge.

Plate XI.



Polymastia brevis 1-9. P. spinula 10-13.
P. radiosa 14—18.

W. Lens Aldous del. et lith. ad. nat.

W. West & Co. imp

PLATE XI.

POLYMASTIA BREVIS, *Bowerbank*.

Vol. ii, p. 64, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the largest specimen of the species hitherto known, from the cabinet of the Rev. A. M. Norman, who obtained it at Shetland. Natural size. The form of this specimen is somewhat abnormal, arising, probably, from age and accidental dilapidation.

Figs. 2, 3, 4, 5, 6.—Represent specimens of about the usual size, selected from among those sent to me by the late Mr. Barlee, illustrating the usual amount of deviations from the normal form that obtain among the spongiadæ. Natural size.

Fig. 7.—A longitudinal section of a specimen of the normal form with an expanded base, exhibiting a view of the interior of the sponge. Natural size.

Fig. 8.—A large super-fusiformi-acuate spiculum from one of the primary longitudinal fasciculi of the skeleton. × 123 linear.

Fig. 9.—One of the acuate, external, defensive spicula from the surface of the sponge. × 123 linear.

By an error of the compositor and an oversight in the correction of the press the spicula, in the description of the specific character of this species in p. 64, vol. ii, have been designated acerate instead of acuate.

Fig. 358, pl. xxix, vol. i, represents a small portion of the side of one of the large cloacæ, exhibiting the structure and mode of disposition of the primary longitudinal fasciculi of the skeleton, with a view of the

secondary spicula of the interlacing portion of the structure. × 25 linear.

In the "Last Report on Dredging among the Shetland Isles," 'British Association Reports' for 1868, p. 329, the Rev. A. M. Norman proposes to make this species the type of a new genus, and to designate it *Quasillina*, and he thus characterises the genus:

"Sponge consisting of a single, clavate, hollow body, widening upwards from the base, and rising at once from the surface of the stone to which it is attached, without any expanded basal mass. Skeleton, beautifully reticulate, primary fasciculi ascending in parallel straight lines from the base, and in diverging, radiating lines from a central mammæform projection at the summit of the sponge; secondary fasciculi at right angles to the primary ones. Spicula fusiformi-acuate."

I cannot concur in the idea of separating this species from the rest of those comprised in the genus *Polymastia*, and with which it is in perfect accordance with every one of their common anatomical characters. The inhalent and exhalent organs occupy the same relative positions in the sponge, and even the forms and position of the spicula are the same as those of the greater number of species of *Polymastia*. The author of the proposed new genus does not, in the characterisation of *Quasillina*, show the slightest anatomical difference from *Polymastia;* and the only difference between them, on which he grounds his reason for making *P. brevis* into a new genus, is that the "sponge consists of a single, clavate, hollow body, widening upwards from the base, and rising at once from the surface of the stone to which it is attached without any expanded basal mass." These characters founded on external form apply correctly enough to the single, outsized, abnormal specimen on which his description is based, but they do not apply with equal correctness to the series of ordinary-sized specimens

of the same species as exhibited in the forms of those represented in pl. x, figs. 2—7, accompanying the one (fig. 1) on which the author bases the characters of his proposed new genus.

Independent of the well-known and universally-acknowledged protean habits of the spongiadæ, which renders form one of the least valuable characters either specific or generic, it is in the genus *Polymastia* more than usually inappropriate. Thus, in *P. ornata*, bulbosa, and radiosa, we have hitherto known but one fistular projection forming the sponge; and even in *P. mammellaris* it is not an uncommon circumstance to find young specimens with but one cloacal projection, as represented in pl. xi, fig. 2, while in mature ones they are much too numerous to be readily counted. The mammæform projection on the summit in Mr. Norman's specimen is evidently an abnormal structure, as it is not to be found in any other specimen of the species with which I am acquainted; it is, therefore, perfectly inadmissible in a generic description.

Polymastia spinula, *Bowerbank.*

Vol. ii, p. 66, 'Mon. Brit. Spongiadæ.'

Fig. 10.—A fully-developed specimen of the species with six fistulæ dredged in from forty to fifty fathoms from five to seven miles off Balta, by the Rev. A. M. Norman. Natural size.

Fig. 11.—A skeleton spiculum from one of the primary, longitudinal fasciculi. × 123 linear.

Fig. 12.—One of the spinulate, external, defensive spicula. × 123 linear.

Fig. 13.—A specimen of *P. spinula*, from the Moray Frith, presented to me by the Rev. Walter Gregor, described in p. 67, 'Mon. Brit. Spongiadæ.' Natural size.

Since the figures described above were drawn I have received from my friend the Rev. A. M. Norman a

specimen of this species for examination, labelled "5—6 miles east of Balta Shetland, 1867." This specimen has thirteen fistulæ on an irregular mass of old shells, &c., about one inch in diameter. Some of these organs are long and slender, like that represented in fig. 13, pl. x; but the greater number of them were comparatively very much shorter and stouter in their proportions. This specimen has the largest number of cloacal fistulæ that I have yet seen on one basal mass, and this fact, in combination with the shorter and stouter proportions of those organs, causes it strongly to resemble a specimen of P. mammellaris; and it is only by a microscopical examination that it can be separated with certainty from that species.

Polymastia radiosa, *Bowerbank.*

Vol. ii, p. 68, 'Mon. Brit. Spongiadæ.'

Figs. 14, 15.—The two type-specimens of *P. radiosa*. Natural size.

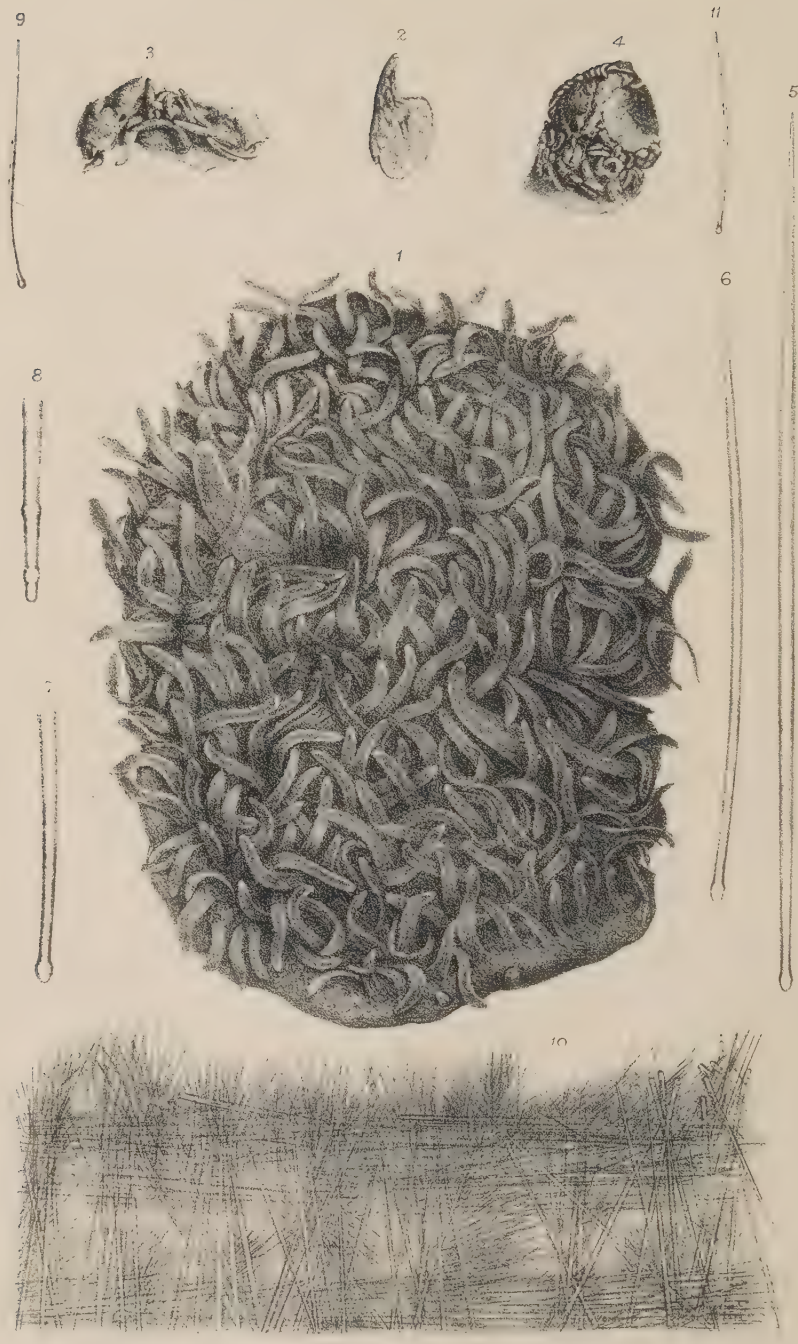
Fig. 16.—Represents a portion of the surface of fig. 15, exhibiting the large radiating groups of external defensive spicula. × 80 linear.

Figs. 17, 18.—Two of the spicula from the radiating groups of external, defensive spicula. × 123 linear.

On January 15th, 1870, I received two more specimens of this pretty little species, both attached side by side, but separate from each other on the inner surface of a triangular fragment of a bivalve shell scarcely exceeding a superficial square half inch. These two specimens were very little different from those figured; one of them was nearly of the same size and proportions of fig. 14, pl. x. The other was of about the same length, but broader in its proportions. Both were attached to the shell for the whole of their length, confirming in this respect the singular habit of the first two specimens. Neither of these specimens exhibited the beautiful radiose structure of the surface repre-

sented by fig. 16, the specimens having apparently suffered by attrition from other bodies; in this respect they coincided with the sponge represented by fig. 14. In every other structural character they agreed with the type-specimens. These specimens were dredged at the Hebrides by Mr. J. G. Jeffreys, and were preserved for me by my indefatigable friend Mr. Peach in 1866. On the box containing them is written "Taken out of sand." This note may probably account for the destruction of the radiating fasciculi of their surfaces.

Plate XII.



Polymastia mammillaris 1–11.

W. West & C° imp.

PLATE XII.

POLYMASTIA MAMMILLARIS, *Bowerbank.*

Vol. ii, p. 71, 'Mon. Brit. Spongiadæ.'

Fig. 1.—A remarkably-fine adult specimen of *P. mammillaris* from Larne Lough, Ireland, in the state in which it came from the sea, having been preserved in spirit. Natural size.

Fig. 2.—A young specimen of the same species with one fistula only partially developed, in the dried state. Natural size.

Figs. 3, 4.—Young specimens of the same sponge, with the fistulæ in a more advanced stage of development, but still incomplete, from dried specimens. Natural size.

Figs. 5, 6.—Two of the fusiformi-spinulate, skeleton spicula. × 123 linear.

Fig. 7.—The basal portion of one of the fusiformi-enormi-spinulate, skeleton spicula. × 250 linear.

Fig. 8.—The basal portion of a bispinulate, skeleton spiculum. × 250 linear.

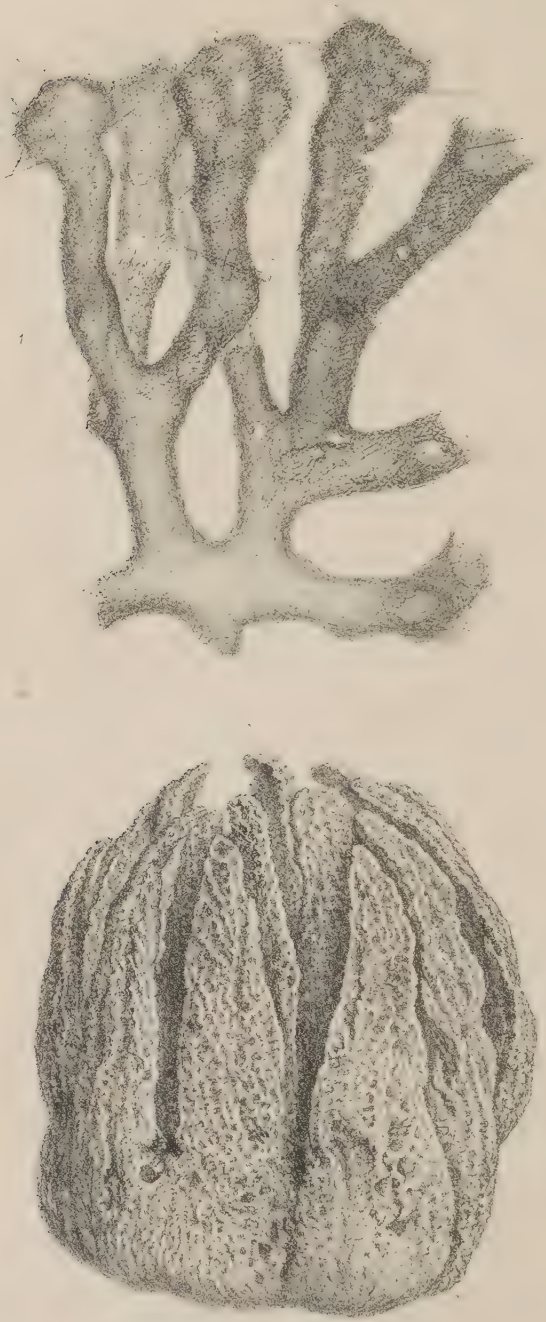
Fig. 9.—One of the skeleton spicula in an early stage of development, showing the prominent spinulation of its base. × 250 linear.

Fig. 10.—A portion of the external surface of one of the adult fistula near its distal termination, exhibiting portions of two of the primary fasciculi of the skeleton, the transverse bands of secondary skeleton spicula, and the radiating fasciculi of external defensive spicula, from a specimen in Canada balsam. × 80 linear.

Fig. 11.—One of the small, fusiformi-spinulate, external defensive spicula. × 123 linear.

The character of the spinulation of the skeleton spicula is best exhibited in those from the basal mass of the sponge, and in those with a power of 108 linear, in consequence of the attenuation of the shaft towards its basal portion, they are not strikingly demonstrated. To obtain a satisfactory view of them they should be seen with a power of about 200 linear. The spinulate character in the skeletons of the cloacæ are rarely visible. The spinulation of the spiculum is not purely so, and the enormi-spinulate form is of most frequent occurrence. Sometimes the spinulation is very close to the basal end of the spiculum, and at other times it is at two or three times the diameter of the spiculum from the base, and occasionally, but rarely, there is a second inflation on the shaft of the spiculum eight or ten diameters above the primary one, as represented by fig. 8, pl. xi. In young and immature skeleton spicula the spinulation is more strikingly displayed than in the adult one, as represented by fig. 11, × 123. As the spicula arrive at maturity the inflation becomes lessened in its proportions as compared with the diameter of the shaft, as in figs. 5 and 6.

Polymastia mammillaris is found in Larne Lough attached to stones at low-water mark, and can only be obtained at unusually low spring tides. The specimen figured was obtained by Mr. W. Darragh, March 25th, 1849. When alive and in the water he says it is of a yellow colour.



Halyphysema [illegible] Cyclolepis pemeilus 2 – 4.

W. Lens Aldous del. et lith. ad nat.

[illegible] imp.

PLATE XIII.

Halyphysema Tumanowiczü, *Bowerbank.*

Vol. ii, p. 76, 'Mon. Brit. Spongiadæ.'

A fine specimen of this sponge based on a portion of the stem of a zoophyte, × 175 linear, is represented by fig. 359, plate xxx, vol. ii, 'Mon. Brit. Spongiadæ.'

Halyphysema ramulosa, *Bowerbank.*

Vol. ii, p. 79, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a portion of the only specimen that has yet been found, and which is in the cabinet of the Rev. A. M. Norman. The sponge figured is from a preparation in Canada balsam. × 36 linear.

Ciocalypta penicillus, *Bowerbank.*

Vol. ii, p. 81, 'Mon. Brit. Spongiadæ.'

Fig. 2.—Represents the second fine specimen of this sponge that I obtained from the Diamond Trawling Ground, off Hastings. It is described in p. 82 of the volume quoted above. The external characters of the specimen are in a finer state of preservation than those of the one first described in p. 81.

Figs. 3, 4.—Represent two of the skeleton spicula. × 80 linear.

The spicula are all of the same form, but they vary in diameter from exceedingly slender to rather stout.

Fig. 360, plate xxx, vol. ii, represents a longitudinal section through the central axis of one of the elongate

cloacal appendages of the sponge, exhibiting the central column with the small cylindrical pedicles or short fasciculi of closely packed spicula, each terminating at the inner surface of the dermis of the sponge of the natural size, taken from the largest of the two specimens described.

Fig. 361 in the same plate is from a section of the specimen represented by fig. 360 at about the middle of the cloacal column, exhibiting the mode of the radiation of the distal ends of the small pedicles on the inner surface of the dermis. × 25 linear.

I have two other specimens of this sponge beside those previously described. One of them has the base two inches in length by ten lines in width. It is three and a half inches in height, and has four large penicillate organs, which have their origin within half an inch of the base of the sponge. The other specimen has a flat base, two inches in length by one and a half inch in width. It has fifteen small penicillate organs on its upper surface, none of which exceed eight lines in height and about one line and a half in diameter. The greatest height of the sponge does not exceed ten lines. In every anatomical character the last two sponges are in perfect accordance with the former two.

The species *C. penicillus* is the only British one known, but there is another species from Port Elizabeth, Australia, two specimens of which are in the cabinet of my friend Captain Charles Tyler. They so closely resemble the British species in their external characters and in the mode of the arrangement of their skeleton structures as to render it quite impossible to distinguish the one from the other excepting by the aid of the microscope. The skeleton of the British species is then seen to be composed of stout, fusiform, acuate spicula, while that of the Australian species is formed of acerate spicula; excepting this important character, they certainly could not be separated from each other.

Tethea cranium on Isodictya infundibuliformis.

W. Lucas Aloious del. et lith. ad nat.

W. West & Co. imp.

PLATE XIV.

Tethea cranium, *Lamarck.*

Vol. ii, p. 83, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents an average-sized specimen of the sponge parasitical within an incomplete cup-shaped specimen of Isodictya infundibuliformis. Natural size, drawn from the specimens in the condition in which they came from the sea, having been preserved in a saturated solution of salt in water.

Fig. 2.—From young specimens of the same two sponges, represented by fig. 1, in the condition in which they came from the sea. Natural size.

This parasitical habit of *Tethea cranium*, locating itself within the cup of I. infundibuliformis, is by no means of uncommon occurrence.

Fig. 3.—An ovate form of T. cranium from a specimen in the condition in which it came from the sea. Natural size.

Fig. 4.—A section of a specimen of T. cranium at right angles to its long axis, exhibiting the mode of disposition of the skeleton fasciculi and numerous gemmules embedded amid the tissues. Natural size. From a wet specimen.

Fig. 5.—A group of minute, sigmoid, bihamate spicula from the sarcodous membranes of the sponge. × 1166 linear.

These remarkable spicula eminently characterise the species. There is a sponge of the same genus from the Antarctic regions, *T. simillima*, Bowerbank, MS., which very closely resembles the anatomical structures of T. cranium, but differs from it in the total absence of the sigmoid bihamate spicula.

Fig. 6.—One of the skeleton spicula. × 80 linear.

In vol. i, plate xxxi, fig. 362 represents a section at right angles to the surface of a specimen of T. cranium, exhibiting the radiating defensive fasciculi of spicula and other interesting points in the anatomy of the sponge.

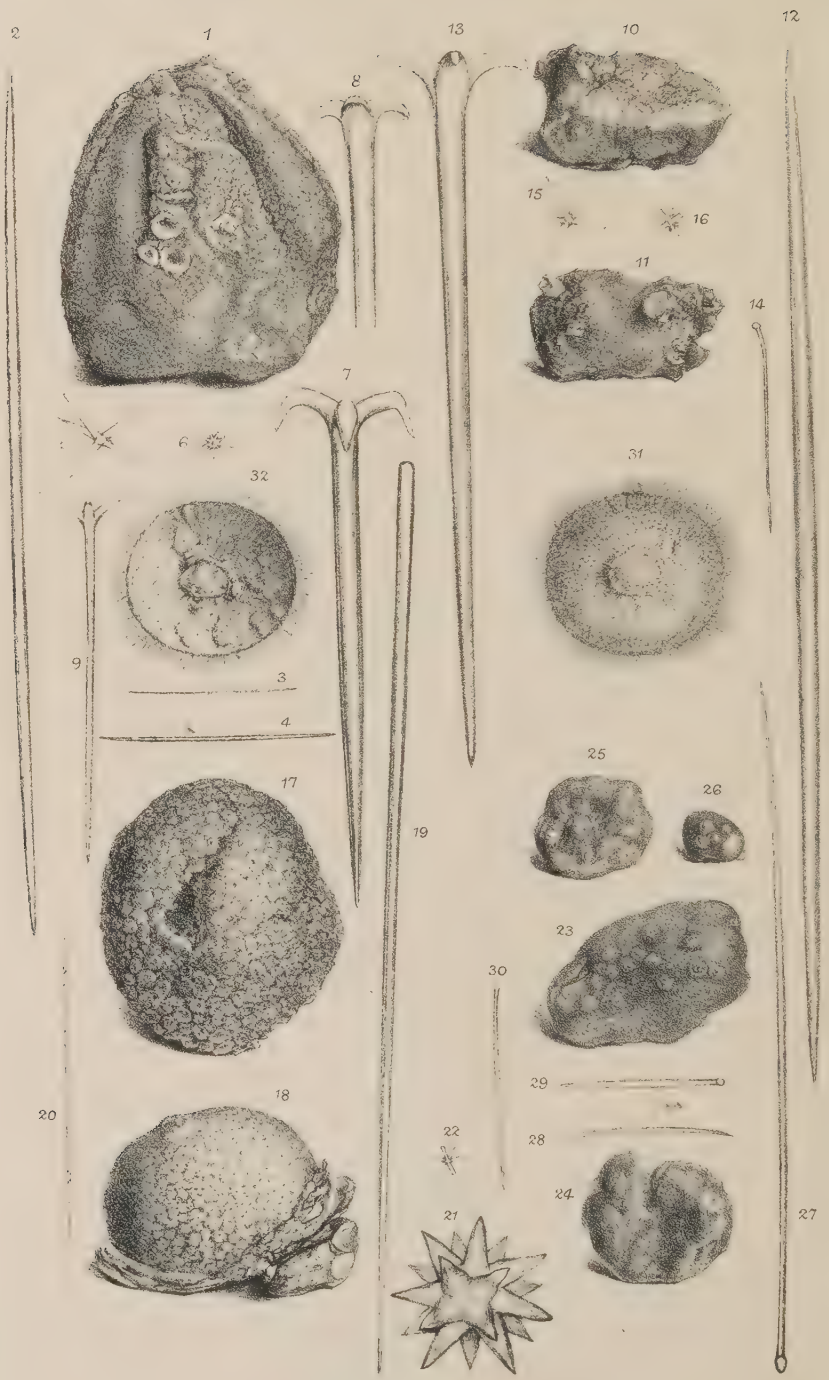
In the same volume, plate xxv, fig. 343 represents the two sorts of gemmules that are found in adult specimens of T. cranium, and fig. 344 a gemmule of the largest description in its natural state, as seen by direct light. × 25 linear.

In the same volume, plate iv, figs. 77 to 82, the porrecto-ternate and recurvo-ternate defensive spicula are represented and described.

This sponge is subject to much variation in size in different localities.

Mr. Barlee sent me twelve specimens in the dried state, which he dredged at the Isle of Arran, Galway. None of them exceeded the size of a large dried pea. On making a vertical section of one of them I found all the characteristic spicula of the species, but not so fully developed as in the larger specimens from Shetland.

Plate XV.



Tethea Collingsii 1–9. T. Schmidtii 10–16. T. Lyncurium 17–22.
T. spinularia 23–30. Halicnemia patera 31–32.

W. Lens Aldous del. et lith. ad nat. W. West & Co. imp.

PLATE XV.

Tethea Collingsii, *Bowerbank.*

Vol. ii, p. 87, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the specimen found by me in the second of the Guliot caves at Sark, in the condition in which it came from off the rock between high and low-water marks. Natural size.

There are the basal portions of several small Balani firmly attached to its surface, indicating that it was probably several years old.

Fig. 2. — A fusiformi-acerate skeleton spiculum. × 80 linear.

Figs. 3, 4.—Minute, acerate, tension spicula of the dermis. × 80 linear.

Fig. 5.—A large, attenuato-stellate, retentive spiculum from the dermal membrane. × 320 linear.

Fig. 6.—One of the small, attenuato-stellate, retentive spicula of the dermal membrane. × 320 linear.

Fig. 7. — A fully-developed, geniculated, recurvo-patento, ternate, connecting spiculum. × 80 linear.

Fig. 8.—The head of one of the geniculated, recurvo-patento, ternate, connecting spicula, not completely developed. × 80 linear.

Fig. 9.—One of the geniculated, recurvo-patento, ternate, connecting spicula, in an early stage of development. × 80 linear.

The immature spicula represented by figs. 8 and 9 are very numerous, and every possible intermediate form between figs. 7 and 9 may be observed.

In vol. i, plate ii, fig. 48, 'Mon. Brit. Spongiadæ,' there is a figure of one of the fully developed connecting spicula of this species as the type of a "geniculated, expando-ternate," connecting spiculum. This

specimen has one of the ternate radii bifurcated, a variation not uncommon among the adult spicula of this form in *Tethea Collingsii*.

Tethea Schmidtii, *Bowerbank*.

Vol. ii, p. 89, 'Mon. Brit. Spongiadæ.'

Fig. 10.—Represents the specimen I received from my late friend Mrs. Buckland. It was relaxed from the dried condition by immersion in cold water, and by that means it attained as nearly as possible its natural proportions and appearance. Natural size.

Fig. 11.—A second specimen of the same species which I found in the Guliot caves. It was drawn from the sponge as it came from the sea, having been preserved in spirit. Natural size.

This specimen has small Balani parasitical on its surface, indicating that it had probably existed several years.

Fig. 12. — A fusiformi-acerate skeleton spiculum. × 80 linear.

Fig. 13. — A fully-developed, attenuato-recurvo, patento-ternate, connecting spiculum. × 80 linear.

Fig. 14.—A spinulate tension and external defensive spiculum from the dermal membrane. × 80 linear.

Fig. 15.—One of the large, attenuato-stellate, retentive spicula from the dermal membrane. × 320 linear.

Fig. 16.—One of the minute, cylindro-stellate, retentive spicula from the dermal membrane. × 320 linear.

Tethea Lyncurium, *Johnston*.

Vol. ii, p. 92, 'Mon. Brit. Spongiadæ.'

Fig. 17.—Represents a specimen preserved in spirit as it came from the sea at Plymouth. Natural size.

Fig. 18.—A second specimen from the same locality,

preserved in spirit as it came from the sea. Natural size.

This specimen is based on the remains of a fucus, and partially so to a small pebble on one side of it.

In consequence of their immersion in spirit the corymbose terminations of the skeleton fasciculi are distinctly visible in both specimens, but they are not projected beyond the surface as it is usual in dried specimens.

Fig. 19.—One of the fusiformi-acuate skeleton spicula. × 80 linear.

Fig. 20.—One of the slender, fusiformi-acerate, tension spicula of the interstitial membranes. × 80 linear.

Fig. 21.—A large, sub-sphero-stellate spiculum, with acutely conical radii from the dermis. × 320 linear.

Fig. 22.—One of the minute, cylindro-stellate, retentive spicula from the inner surface of the dermal membrane. × 320 linear. A large number of these spicula have the radii more or less acutely terminated.

In vol. i, plate xxv, fig. 342, ‘Mon. Brit. Spongiadæ,’ there is figured one of the external gemmules of this species from the base of a specimen found at Plymouth by my late friend Mr. Thomas Howard Stewart. × 50 linear.

Mr. Peach has also found this species in Fowey Harbour.

Tethea spinularia, *Bowerbank*.

Vol. ii, p. 94, ‘Mon. Brit. Spongiadæ.’

Fig. 23.—Represents the largest specimen of this species that I have yet seen. It was dredged at Shetland by the Rev. A. M. Norman, in whose possession it remains. It was relaxed in salt water previously to being figured. Thirteen distinct mammil-

lated oscula are visible on its surface, and five of them have the central orifice more or less open. Natural size.

Figs. 24, 25, 26.—Three smaller specimens from the same locality, for which I am indebted to my friend Mr. Norman. These three specimens expanded by immersion in water to a much greater proportional extent than the larger ones represented by fig. 23. They all exhibited the same mammillated oscula that are so abundant on the largest specimen. Natural size.

Fig. 27.—One of the sub-fusiformi, ovo-spinulate, skeleton spicula. × 80 linear.

Fig. 28.—One of the minute acerate spicula from the fasciculi of the dermal membrane. × 80 linear.

Fig. 29.—One of the short, stout, fusiformi-ovo-spinulate, external, defensive spicula. × 80 linear.

Fig. 30.—One of the small, sub-fusiformi-ovo-spinulate, tension spicula of the interstitial membranes. × 80 linear.

Halicnemia patera, *Bowerbank*.

Vol. ii, p. 96, 'Mon. Brit. Spongiadæ.'

Fig. 31.—Represents the upper or convex side of the specimen I received from my late friend Mr. Barlee in the dried state and of the natural size.

Fig. 32.—Exhibits the concave or under surface of the same specimen in the dried state. Natural size.

In vol. i, plate xxxii, fig. 363, a portion of a section of this specimen is represented, exhibiting the mode of the disposition of the spicula of the skeleton. × 25 linear.

Fig. 364 in the same plate represents a portion of the same section. × 108 linear.

In the same volume, plate x, figs. 228 to 233 represent various forms of spinulate spicula from the same specimen.

Plate XVI.

Dictyocylindrus ventilabrum 1–5. D. ramosus 6–12.

W. Lens Aldous del. et lith. ad nat

W. West & Co. imp.

PLATE XVI.

Dictyocylindrus ventilabrum, *Bowerbank.*

Vol. ii, p. 100, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the sponge half the natural size in its dried state.

Fig. 2.—An acuate skeleton spiculum. × 80 linear. The same figure will suffice to represent one of the external defensive spicula.

Fig. 3.—One of the flexuous acerate skeleton spicula. × 80 linear.

Fig. 4.—A fusiformi, acuate, tension spiculum from the interstitial membranes. × 80 linear.

Fig. 5.—An internal defensive spiculum, entirely but minutely spinous. × 250 linear.

Dictyocylindrus ramosus, *Bowerbank.*

Fig. 6.—Represents a dried specimen of D. ramosus of about the average size, and in a living condition when it was found, and is a fine specimen of the normal branching form of the species. Natural size.

Fig. 7.—Exhibits the palmate form that frequently occurs to more or less extent in this species. This sponge is one of the most purely palmate specimens that I have yet seen. Natural size.

Fig. 8.—Represents a small palmate specimen, which exhibits the mode by which the palmate form is effected by the branches coalescing laterally. Natural size.

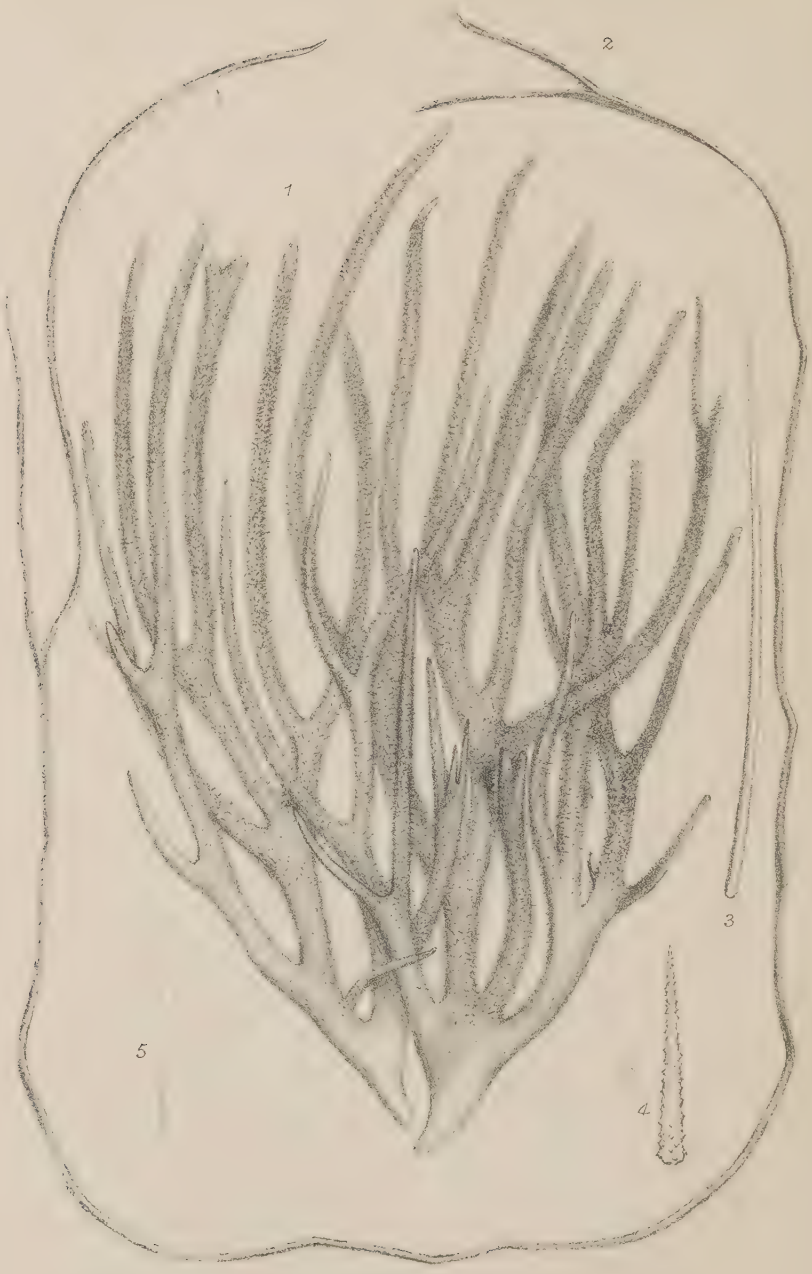
Fig. 9.—One of the acuate spicula of the axial column of the sponge. × 80 linear. This figure also represents one of the radial spicula equally well.

Fig. 10.—Represents one of the cylindrical skeleton spicula from the axial column. × 80 linear.

Fig. 11.—One of the attenuato-acuate, sub-spinulate internal defensive spicula. × 250 linear.

Fig. 12.—A slender acuate tension spiculum from the interstitial membranes. × 80 linear.

Plate XVII.



Dictyocylindrus hispidus.

W. Lens Aldous del et lith ad nat

W West & Co imp.

PLATE XVII.

Dictiocylindrus hispidus, *Bowerbank.*

Vol. ii, p. 108, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a specimen from the Diamond Trawling Ground, off Hastings, in the condition in which it came from the sea. It is more than usually branched, and has probably originally been two specimens united by approximation, and it has evidently been separated for a considerable period from its natural base. This species occurs in every variety of form from a single stem with one or two branches only up to the complex-branching specimen figured. In this specimen the hispidation is very slightly apparent, while in dried specimens it is abundantly visible. Natural size.

Fig. 2.—Represents a singular variety of the species dredged by Mr. Jonathan Couch, of Polperro, off the Dodman in forty fathoms, October, 1866. Numerous other similar specimens were obtained in the same locality at the same time. Mr. Couch kindly sent me three of the specimens, and in neither of them could I detect any appearance of a basal attachment. One of the specimens is considerably longer than that represented by fig. 2, but the diameter of the whole were as nearly as possible the same, and in the living state they were as flexible as a piece of soft wet string. Very slight indications of hispidation were visible; although so different in external character, their internal structures were in perfect accordance. Natural size in the wet state.

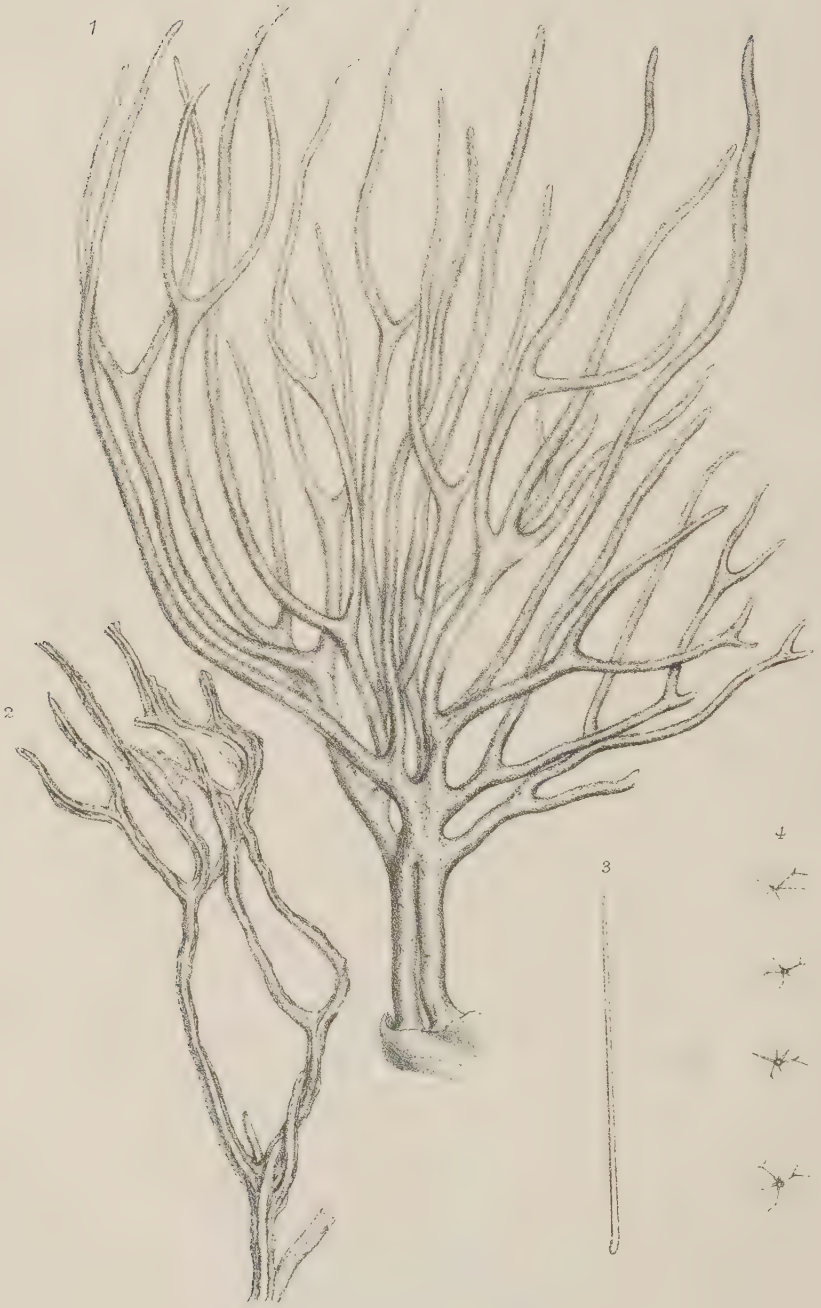
Fig. 3.—One of the skeleton spicula from the central axis of the sponge. × 80 linear.

This spiculum also represents one of the external defensive spicula.

Fig. 4.—One of the internal defensive spicula. × 320 linear.

Fig. 5.—One of the tension spicula from the interstitial membranes. × 80 linear.

Plate XVIII.



Dictyocylindrus fasciculatis.

W. Lens Aldous del. et lith.

W West & Co imp

PLATE XVIII.

Dictyocylindrus fasciculatus, *Bowerbank.*

Vol. ii, p. 110, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the finest and most perfect specimen I have yet seen from the Diamond Trawling Ground, off Hastings, in the condition in which it came from the sea, and of the natural size. In its wet and natural state the branches were cylindrical and of a rich amber yellow colour, and no spicula were projected through the dermal membrane.

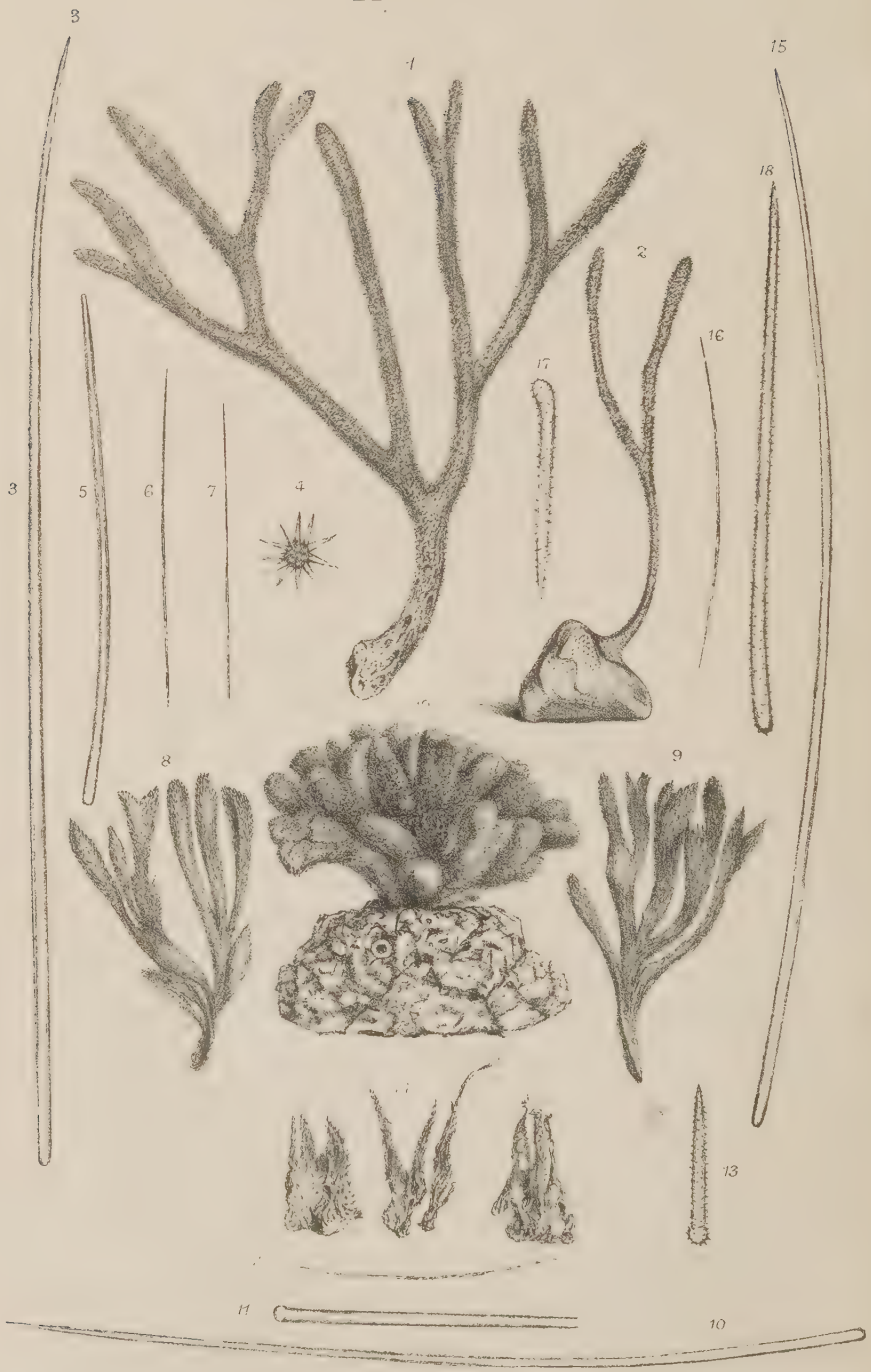
Fig. 2.—Is from a portion of a dried specimen from the same locality as that represented by fig. 1. It exhibits the contracted aspect of the sponge from drying; the sarcodous external portions assuming the form of longitudinal angular ridges. Natural size.

Fig. 3.—One of the skeleton spicula from the axial column of the sponge. × 80 linear.

Fig. 4.—Represents four of the minute stellate spicula of the sarcode of the interstitial membranes from the specimen represented by fig. 1. × 530 linear. From this specimen I obtained a more satisfactory view of these minute organs than I had previously, and I found the radii in the greater portion of them more or less furcated. These spicula are strikingly illustrative of the species.

The development of more than one principal branch from the base is not singular in the specimen figured. I have another specimen which has two perfect stems, and the remainder of a third one from the same base.

Plate XIX.



Dictyocylindrus stuposus 1–7. D. Howsei 8–13. D. virgultosa 14–18.
D. pumilus 19 & Plate XXI. 1–4.

W. Lens Aldous del. et lith

W. West & Co imp.

PLATE XIX.

Dictyocylindrus stuposus, *Bowerbank.*

Vol. ii, p. 116, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a fully-developed specimen of the species from Shetland in the cabinet of the Rev. A. M. Norman. The sponge had been dried, but previous to being drawn it was immersed in water for about twelve hours, which restored it to, as nearly as possible, the condition in which it came from the sea. Natural size.

Fig. 2.—A young specimen in the condition in which it came from the sea at Shetland, having been preserved in a saturated solution of salt in water. Natural size. This specimen is attached by its natural base to a pebble.

Fig. 3.—One of the large attenuato-acuate external defensive spicula radiating from the surface of the axial column of the sponge. × 80 linear. In the living state these spicula project very slightly beyond the dermal surface, but in dried specimens they are frequently projected to the extent of half or two thirds of their length in consequence of the contraction of the abundant sarcode of the sponge.

Fig. 4.—Represents an average-sized, attenuato-sphero-stellate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 5.—One of the rather short cylindrical skeleton spicula from the axial column. × 80 linear.

Fig. 6.—One of the slender acerate tension spicula of the interstitial membranes. × 80 linear.

Fig. 7.—A slender acuate tension spiculum from the interstitial membranes. × 80 linear.

Dictyocylindrus Howsei, *Bowerbank.*

Vol. ii, p. 106, 'Mon. Brit. Spongiadæ.'

Fig. 8.—Represents a specimen of the species from Douglas Bay, Isle of Man, expanded by immersion in water to as nearly as possible its living condition. Natural size. I received this specimen from Mr. Howse.

Fig. 9.—A second specimen of the same species from Douglas Bay, Isle of Man, expanded in water to nearly its living condition. Natural size. In the cabinet of the Rev. A. M. Norman.

Fig. 10.—A sub-fusiformi-acuate skeleton spiculum. × 80 linear. This figure also represents the external defensive spicula.

Fig. 11.—Represents the basal portion of one of skeleton spicula with a sub-spinulate base. × 80 linear.

Fig. 12.—An acuate slender tension spiculum. × 80 linear.

Fig. 13.—One of the entirely spined, subclavated, attenuato-acuate internal defensive spicula from the specimen presented to me by Professor Dickie. × 250 linear.

Dictyocylindrus virgultosus, *Bowerbank.*

Vol. ii, p. 113, 'Mon. Brit. Spongiadæ.'

Fig. 14.—Represents three specimens of *D. virgultosus* from Shetland in the cabinet of the Rev. A. M. Norman. Natural size. The specimens were immersed in water to restore them as nearly as possible to their conditions before they were drawn.

Fig. 15.—An acuate skeleton spiculum. × 80 linear. This figure also represents the large external defensive spicula radiating from the axial skeleton.

Fig. 16.—One of the slender fasciculated external

defensive spicula. × 80 linear. These spicula are exceedingly numerous.

Fig. 17.—An average-sized, subclavated, internal, defensive spiculum. × 150 linear.

Fig. 18.—One of the large-sized, internal, defensive spicula, profusely but minutely spinous. × 150 linear.

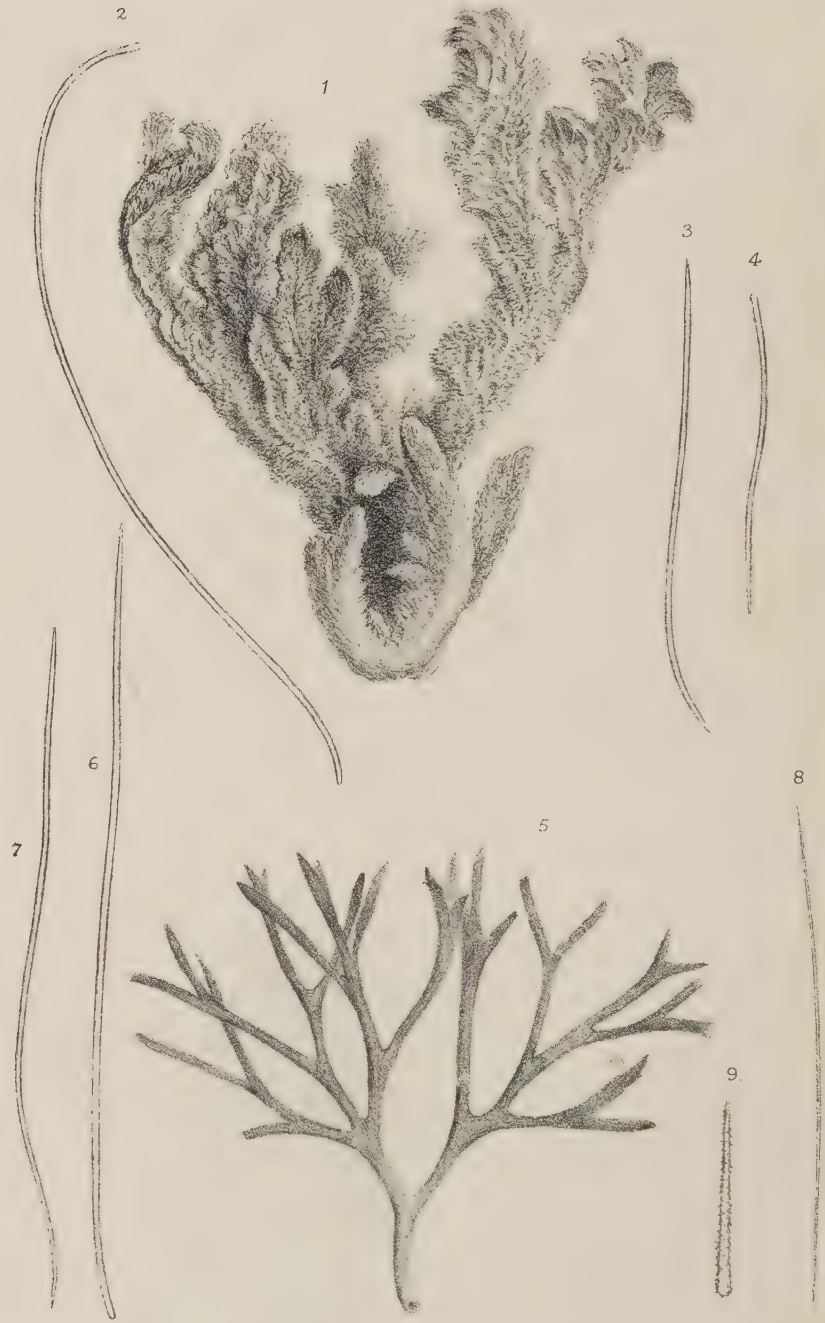
Dictyocylindrus pumilus, *Bowerbank.*

Vol. ii, p. 114, 'Mon. Brit. Spongiadæ.'

Fig. 19.—Represents the specimen I obtained at Tenby. Natural size; dried state. The stone on which the specimen is based is larger than represented in the figure.

For the spicula of this species see Plate XXI, figs. 1, 2, 3, and 4.

Plate XX.



Dictyocylindrus rugosus. 1-4. D. radiosus 5-9.

W Lens Alaione del et lith

H West & C° imp

PLATE XX.

Dictyocylindrus rugosus, *Bowerbank.*

Vol. ii, p. 119, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents an average-sized specimen in the condition in which it came from the sea at Shetland, having been preserved in spirit. Natural size.

The specimen figured is larger than the greater number of the species that I have in my collection. The largest I have seen is in the cabinet of the Rev. A. M. Norman. When dried this species appears very coarsely hispid.

Fig. 2.—One of the flexuous cylindrical spicula from the axial column of the sponge. × 80 linear.

Fig. 3.—One of the acerate spicula of the skeleton. × 80 linear. These spicula vary considerably in form, many of them being sub-fusiform or inequi-acerate.

Fig. 4.—An external, defensive, acuate spiculum from the termination of one of the radial fasciculi.

Dictyocylindrus radiosus, *Bowerbank.*

Vol. ii, p. 105, 'Mon. Brit. Spongiadæ.'

Fig. 5.—Represents the sponge in its dried state. Natural size.

Fig. 6.—One of the acuate skeleton spicula from the axial column of the sponge. This figure also represents the external defensive spicula, the only difference being that they slightly exceed those of the axial column in size. × 80 linear.

Fig. 7.—An acerate skeleton spiculum from the axial column. They are usually rather more slender in their

proportions, and more flexuous than the acuate ones. × 80 linear.

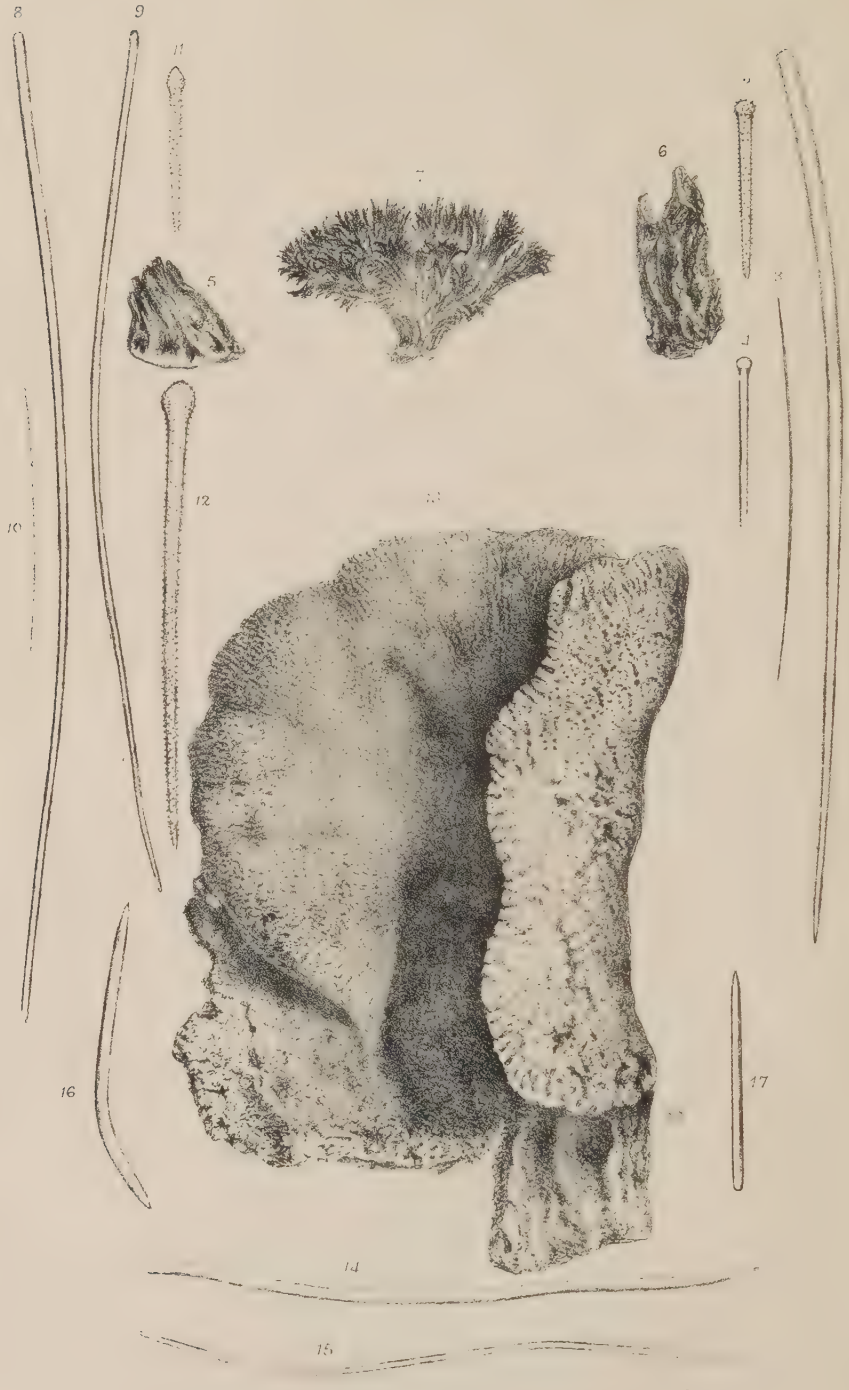
Fig. 8.—One of the very slender, acerate, tension spicula from the dermal membrane. × 80 linear.

Fig. 9.—An attenuato-acuate, entirely-spined, internal, defensive spiculum. × 250 linear.

When I first examined this species of sponge I did not detect this form of spiculum. They are very few in number, and had I not subsequently detected two of them *in sitû* I should have been inclined to have attributed the presence of one of them in the spicula, prepared by nitric acid and mounted in Canada balsam, to an accidental occurrence. We must, therefore, add to the specific description in vol. ii, p. 105, the following description of them:

Internal defensive spicula attenuato-acuate, entirely spined, minute, very few in number.

Plate XXI.



Dictyocylindrus pumilus 1–4. D. aculeatus 5–12.
Phakellia robusta 13–17.

W Lens Aldous del. et lith.

W West & Co imp.

PLATE XXI.

Dictyocylindrus pumilus, *Bowerbank.*

Vol. ii, p. 114, 'Mon. Brit. Spongiadæ.'

See pl. XIX, fig. 19, vol. iii, for a representation of the sponge. In consequence of the great number of the spicula required to illustrate the other three species represented in that plate, those belonging to D. pumilus were forced to be given in another plate.

Fig. 1.—A large, acuate, skeleton spiculum from the axis of one of the columns. × 80 linear.

Fig. 2.—The basal portion of a spinulate skeleton spiculum. × 80 linear.

Fig. 3.—A slender, acerate, tension spiculum. × 80 linear.

Fig. 4.—One of the internal defensive spicula. ×250 linear.

Dictyocylindrus aculeatus, *Bowerbank.*

Vol. ii, p. 109, 'Mon. Brit. Spongiadæ.'

Figs. 5, 6.—Represent specimens dredged off Scarborough by Mr. Bean.

Fig. 7.—A larger and more fully-developed specimen of *D. aculeatus* dredged off the Northumberland coast by Mr. Albany Hancock, to whom I am indebted for this very illustrative specimen. This sponge was soaked in water for some hours before it was drawn, to restore it as nearly as possible to the condition in which it was when in the living state. Natural size. The spicula of this species are from the type-specimen of the species presented to me by my late highly-esteemed friend Mr. Bean, of Scarborough.

Figs. 8, 9.—Acuate spicula from the axis of the sponge. The larger ones (fig. 8) usually form the external defenses, while the smaller (fig. 9) more especially appertain to the skeleton; but both forms occur intermixed in the axial column. × 80 linear.

Fig. 10.—One of the fusiformi-acerate, tension spicula of the interstitial membranes. × 80 linear.

Fig. 11.—One of the internal defensive spicula. × 80 linear.

Fig. 12.—An internal defensive spiculum. × 250 linear, to exhibit their exceedingly minute spination.

Since the description of this species in vol. ii, p. 109, 'Mon. Brit. Spongiadæ,' I have received a specimen from Newcastle from Mr. A. Hancock, and another from the coast of Northumberland by the Rev. A. M. Norman, in 1865. Both these specimens were in the dried state, and were very similar in their external characters to the specimens I received from Mr. Bean. Mr. W. Saville Kent dredged two specimens off Guernsey in 1870, and preserved them in spirit in the state in which they came from the sea. The colour in this condition was a dull olive green. The largest of the two did not exceed eight lines in height; they were irregularly cylindrical, and about two lines in diameter. Their surfaces were very hirsute, the external defensive spicula projecting beyond the dermal surface for a half or two thirds of their length.

Phakellia robusta, *Bowerbank*.

Vol. ii, p. 120, 'Mon. Brit. Spongiadæ.'

Fig. 13.—A specimen of the sponge in the wet condition. Natural size.

This is not the type-specimen described in vol. ii, p. 120, but another one that I subsequently received, with many others of the same species, from my friend Mr. Peach. They are all very nearly of the same size. The one figured was selected in consequence of its fine

state of preservation, and for affording a good view of both surfaces of the sponge by the large natural folding of the expanded surface of the sponge. The Rev. A. M. Norman has a specimen of this species formed of two sponges which have grown together at their margins, and each of these has a folding of their proximal margins so, as it were, to avoid touching each other as much as possible. The width of the double specimen is seven inches, and the height of the largest one four inches.

Figs. 14, 15.—Two of the skeleton spicula from the axial column. × 80 linear.

Figs. 16, 17.—An acerate and an acuate spiculum from the ramuli. × 80 linear.

These two forms of spicula are common to the dermal surface as well as to the ramuli.

Plate XXII.

Phakellia ventilabrum.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE XXII.

Phakellia ventilabrum, *Bowerbank.*

Vol. ii, p. 122, ' Mon. Brit. Spongiadæ.'

Fig. 1.—Represents an expanded cup-shaped specimen of the species of the natural size from the Haaf Banks, Shetland, in the wet condition as it came from the sea.

Fig. 2.—A smaller sized cup-shaped specimen, the cup being naturally cleft to the base of the sponge, natural size; in the wet condition. From the Haaf Banks.

Fig. 3.—An irregularly fan-shaped specimen, natural size, and in the wet condition. From the Haaf Banks.

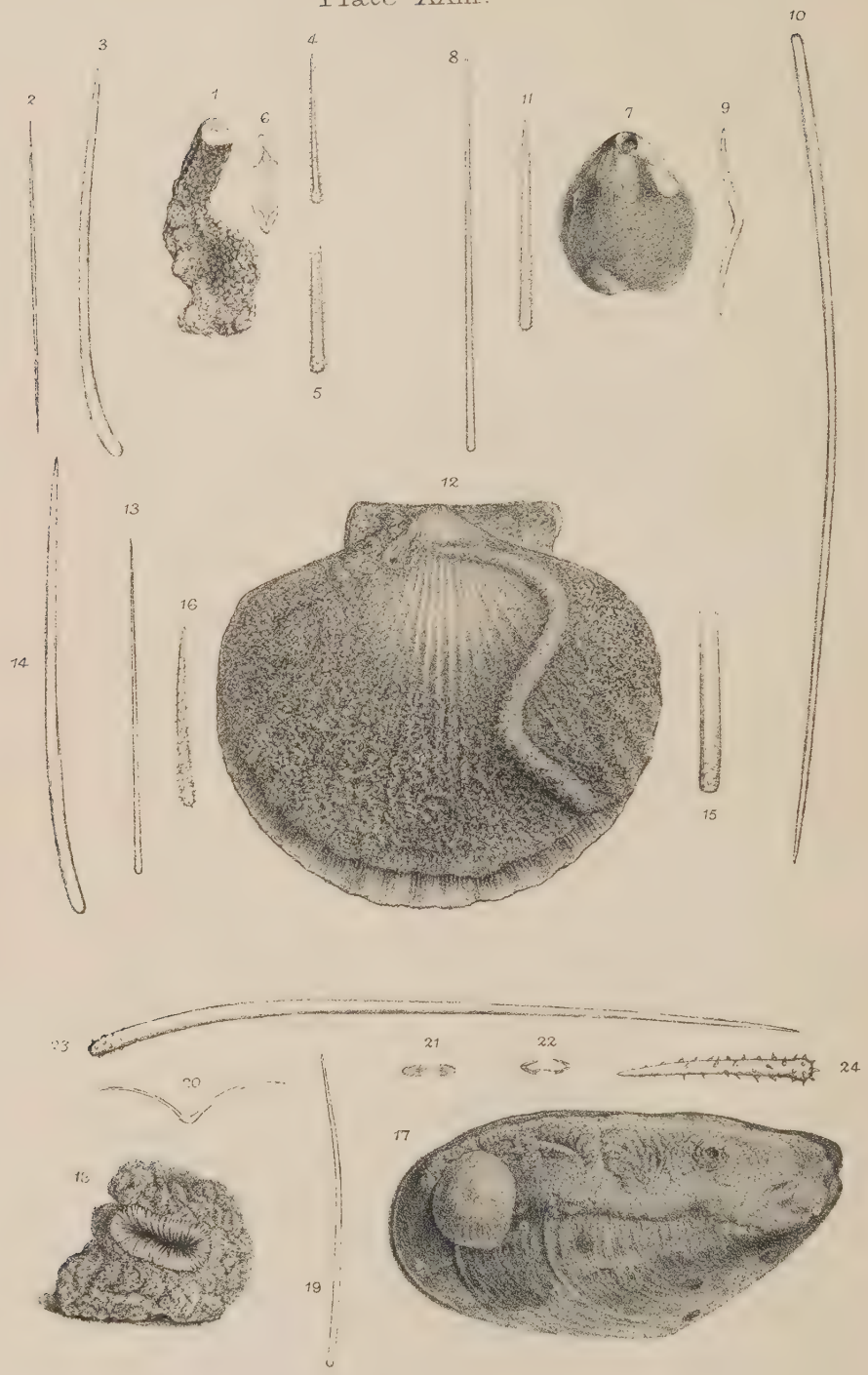
Fig. 4.—A small, cup-shaped specimen of the natural size, from a dried specimen. From the Hebrides. I have received numerous specimens from that locality, the greater portion being cup-shaped, and some of them not exceeding half an inch in height.

Fig. 5.—A skeleton spiculum from one of the axes of the sponge. × 80 linear.

Figs. 6 and 7.—Two of the spicula from the ramuli. × 80 linear.

The greater number of these sponges are more or less cup-shaped, and I have therefore selected that form to illustrate the species; figuring No. 3 as affording an idea of the irregular fan-shaped specimens. The species vary to as great an extent in size as they do in form; some of the cup-shaped ones measured more than ten inches in diameter at their distal margins, and one of the fan-shaped specimens in my possession, a flat specimen gradually expanding from the base upward, measures nineteen inches in height, and nineteen inches in breadth, near its distal extremity. The larger specimens are usually in a more or less dilapidated condition.

Plate XXIII.



Microciona fictitia 1–6. M. lævis 7—11.
M. fallax 12—16. M. armata 17—24.

W. Lens Aldous del. et lith. W. West & C° imp.

PLATE XXIII.

Microciona fictitia, *Bowerbank.*

Vol. ii, p. 124, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 2.—A skeleton spiculum. × 150 linear.

Fig. 3.—One of the basally-spined, attenuato-acuate, external, defensive spicula. × 150 linear.

Fig. 4.—One of the entirely spined attenuato-acuate internal, defensive spicula.. × 150 linear.

Fig. 5.—The basal portion of one of the internal defensive spicula, to exhibit variety in the basal portion. × 250 linear.

Fig. 6.—One of the equi-anchorate, retentive spicula. × 530 linear.

Since the completion of this plate I have obtained a very much larger and finer specimen of this species, which is figured in the supplemental Plate LXXIX of this volume.

Microciona lævis, *Bowerbank.*

Vol. ii, p. 127, 'Mon. Brit. Spongiadæ.'

Fig. 7.—The type-specimen of M. lævis from Shetland. Natural size.

Fig. 8.—One of the attenuato-acuate, tension spicula of the dermal membrane. × 150 linear.

The tension spicula of the dermal membrane in the specific description of the sponge in vol. ii, p. 127, has been printed in error as "attenuato-acerate," whereas it should have been attenuato-acuate.

Fig. 9.—One of the tricurvo-acerate tension spicula of the dermal membrane. × 250 linear.

Fig. 10.—An attenuato-acuate skeleton spiculum. × 80 linear.

Fig. 11.—An attenuato-acuate, entirely spined, internal defensive spiculum. × 150 linear.

Microciona fallax, *Bowerbank*.

Vol. ii, p. 128, 'Mon. Brit. Spongiadæ.'

Fig. 12.—Represents the type-specimen from the Diamond Ground, off Hastings, in the dried condition. Natural size.

Fig. 13.—One of the long, slender, acuate, tension spicula from the dermal membrane. × 250 linear.

Fig. 14.—A skeleton spiculum. × 250 linear.

Fig. 15.—The basal portion of one of the skeleton spicula. × 320 linear, to exhibit the minuteness of the spination.

Fig. 16.—One of the internal, defensive spicula. × 250 linear.

Microciona armata, *Bowerbank*.

Vol. ii, p. 129, 'Mon. Brit. Spongiadæ.'

Fig. 17.—Represents the type-specimen from Strangford Lough, by Dr. Dickie, in the dried condition and of the natural size.

Fig. 18.—A specimen of *M. armata*., surrounding a *Caryophyllia Smithii* from Guernsey, by the Rev. A. M. Norman. In the dried condition and of the natural size.

Fig. 19.—An attenuato-acuate, tension spiculum from the dermal membrane. × 123 linear.

Fig. 20.—One of the anguloid, tricurvato-acerate, retentive spicula from the dermal membrane. × 250 linear.

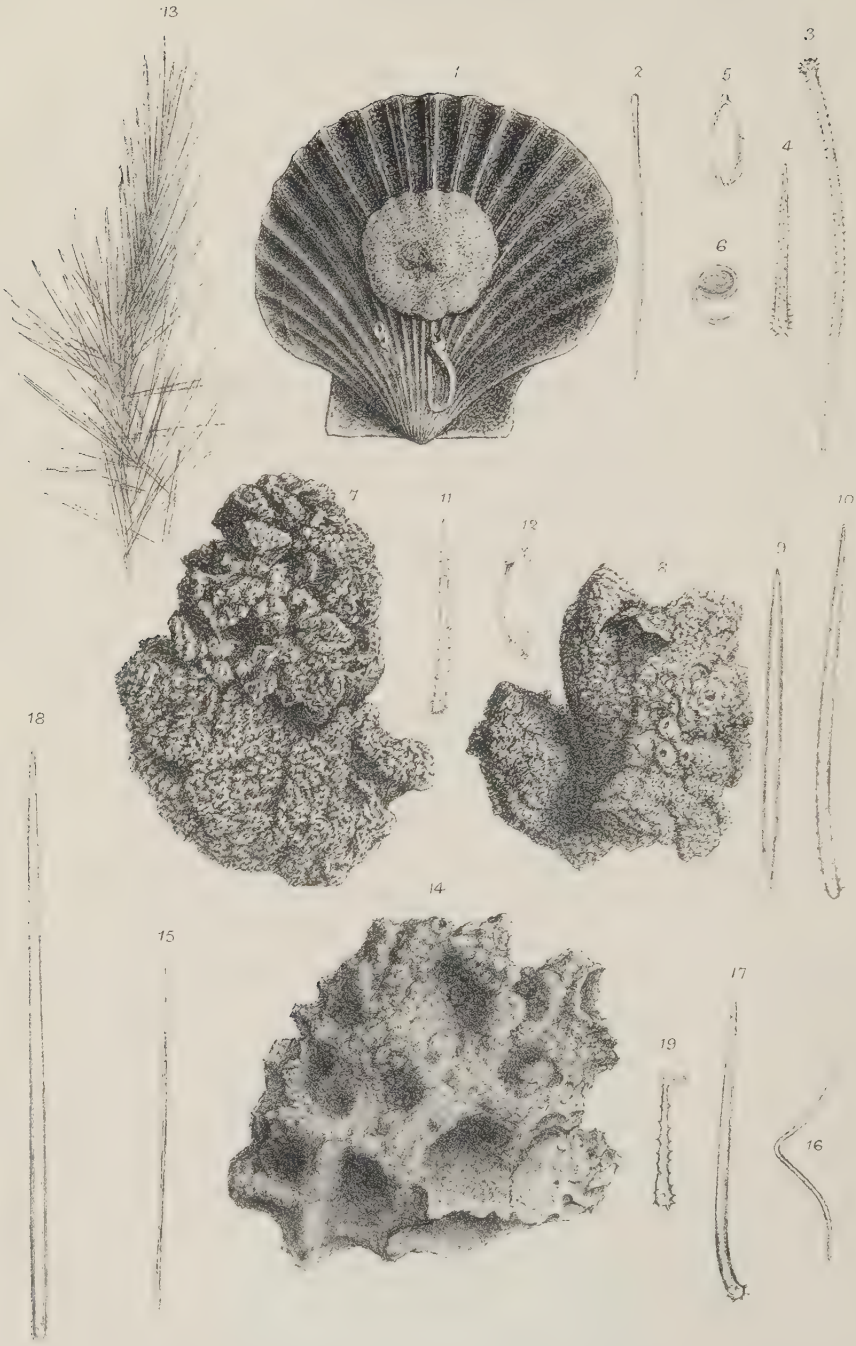
Fig. 21.—A dentato-palmate, equi-anchorate, retentive spiculum from the dermal membrane. × 1000 linear.

Fig. 22.—A bidentate, equi-anchorate, retentive spiculum from the dermal membrane. × 1000 linear.

Fig. 23.—An attenuato-acuate, basally-spined, skeleton spiculum. × 123 linear.

Fig. 24.—An attenuato-acuate, entirely spined, internal, defensive spiculum. × 123 linear.

Plate XXIV.



Microciona spinulenta 1–6. M. plumosa 7–13.
M. atrasanguinea 14–19.

W. Lens Aldous del. et lith.

W. West & C° imp.

PLATE XXIV.

Microciona spinulenta, *Bowerbank.*

Vol. ii, p. 132, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a valve of Pecten opicularis covered with a thin coat of M. spinulenta, all the dark portions between the ribs of the shell having the appearance of the wet pile of a brown cotton velvet. The white patch on the middle of the valve is Cellepura pumicosa. The specimen is from Weymouth Bay, near the wreck of the Abergavenny. Natural size.

Fig. 2.—From one of the sub-clavate, cylindrical, tension spicula of the dermal membrane. × 250 linear.

Fig. 3.—An attenuato-acute, entirely spined, skeleton spiculum; the base being profusely spinous. × 250 linear.

Fig. 4.—One of the short attenuato-acuate, entirely spined, internal, defensive spicula. × 250 linear.

Fig. 5.—One of the bidentate, inequi-anchorate, retentive spicula. × 1250 linear.

Fig. 6.—An unipocilate, retentive spiculum. × 1250 linear.

Microciona plumosa, *Bowerbank.*

Spongia plumosa, Montagu.
Halichondria plumosa, Johnston.
Hymeniacidon plumosa, Bowerbank. 'Mon. Brit. Spong.,' vol. ii, p. 195.
Microciona carnosa, Bowerbank. 'Mon. Brit. Spong.,' vol. ii, p. 133.

The sponges described by me in vol. ii, pp. 195 and 133, are decidedly the same species, and both belong to the genus *Microciona*.

I have fallen into this error through having examined and described the first specimens of this sponge

sent to me by Mrs. Griffiths in MS. long before I was acquainted with the specimens of *Microciona carnosa*, vol, ii, p. 133, Mon. Brit. Spongiadæ, which I subsequently found at Sennen Cove, and it was not until I re-examined the British species of Hymeniacidon for figuring in the present volume that I detected the error I had fallen into in my early description of the specimens sent to me by Mrs. Griffiths; and as Montagu's, specific name of plumosa has precedence of that of carnosa, the species must hereafter be designated Microciona plumosa; the description of the sponge under the designation of *M. carnosa* being received as that of *M. plumosa*.

The general aspect of the species is so different in its living state to what it is in its dried condition, that when I found it alive at Sennen Cove I am not surprised that I did not recognise it as the same as the dried sponges sent to me by Mrs. Griffiths, and I accordingly described it at that time without reference to those specimens.

Fig. 7.—A specimen of *M. plumosa* from Guernsey by the Rev. A. M. Norman. Natural size. From the dried specimen.

Fig. 8.—The type-specimen from Sennen Cove, Land's End, Cornwall. Natural size, in the dried state.

Fig. 9.—A fusiformi-acerate spiculum, from the dermal membrane. × 250 linear.

Fig. 10.—One of the sub-attenuato-acuate, skeleton spicula, entirely spined. × 250 linear.

Fig. 11.—One of the internal, defensive, attenuato-acuate, entirely spined spicula. × 250 linear.

Fig. 12.—One of the bidentate angulated equi-anchorate, retentive spicula, from the interstitial membranes. × 1250 linear.

Fig. 13.—Represents a small portion of one of the long, slender, and flexuous columns of the skeleton of *M. plumosa*. × 150 linear.

This species presents a great variety in its aspect.

Some of the specimens I have from the Diamond Grounds, off Hastings, very thinly coat the stones on which they are based, while from the same locality I have one specimen that is five inches in length and three inches at its greatest breadth, and the thickness and surface characters very like the specimens figured. I have figured a portion of one of the long slender, skeleton columns of this sponge, not only to illustrate the anatomical structure of the species, but also in strong contrast with the remarkably short skeleton columns of *M. atrasanguinea*, represented by fig. 269, plate xxxiv, vol i, 'Mon. Brit. Spongiadæ.'

MICROCIONA ATRASANGUINEA, *Bowerbank.*

Vol. ii, p. 138, 'Mon. Brit. Spongiadæ.'

Fig. 14.—Represents a specimen of *M. atrasanguinea* from the small cave on the north side of St. Katherine's Island, Tenby.

Fig. 15.—One of the long, slender, tension spicula, from the dermal membrane. × 150 linear.

Fig. 16.—A tricurvate, acerate, tension spiculum, from the dermal membrane. × 250 linear.

Fig. 17.—One of the skeleton spicula from the skeleton column. × 150 linear.

Fig. 18.—One of the terminal, skeleton spicula, elongated to act as an external defensive spiculum. × 150 linear.

Fig. 19.—A sub-spinulo-acuate, entirely spined, internal defensive spiculum. × 250 linear.

For further illustrations of this species see vol. i, plate xxxiii, fig. 368, for a single skeleton column in a fully developed condition, × 175 linear; and also fig. 369, plate xxxiv, in the same volume, for a sectional view of the sponge at right angles to its surface. × 108 linear.

I received some thin flakes of this sponge from Mr. Parfitt, of Exeter, on the 1st of March, 1872, who stated that he had scraped it off the shell of one of the recently imported American oysters.

Plate XXV.

PLATE XXV.

MICROCIONA AMBIGUA, *Bowerbank.*

Vol. ii, p. 136, 'Mon. Brit. Sponges.'

Fig. 1.—Represents the type-specimen on a portion of the shell of Pinna ingens ? Natural size.

The sponge is so thin that, although it extends in one unbroken sheet over the surface of the shell, it does not conceal the small parasitic shells beneath it which were previously deposited on the large one.

Fig. 2.—One of the attenuato-acuate basally-spined, skeleton spicula. × 80 linear.

Fig. 3.—The basal portion of one of the skeleton spicula. × 250 linear, to show the minuteness of their spination.

Fig. 4.—One of the slender acerate, tension spicula of the dermal membrane. × 250 linear.

Fig. 5.—One of the attenuato-acuate, entirely spined, internal defensive spicula. × 250 linear.

Fig. 6.—One of the sub-attenuated, cylindrical, entirely-spined, tension spicula of the interstitial membranes.

The forms of the spicula are various and frequently much distorted. × 250 linear.

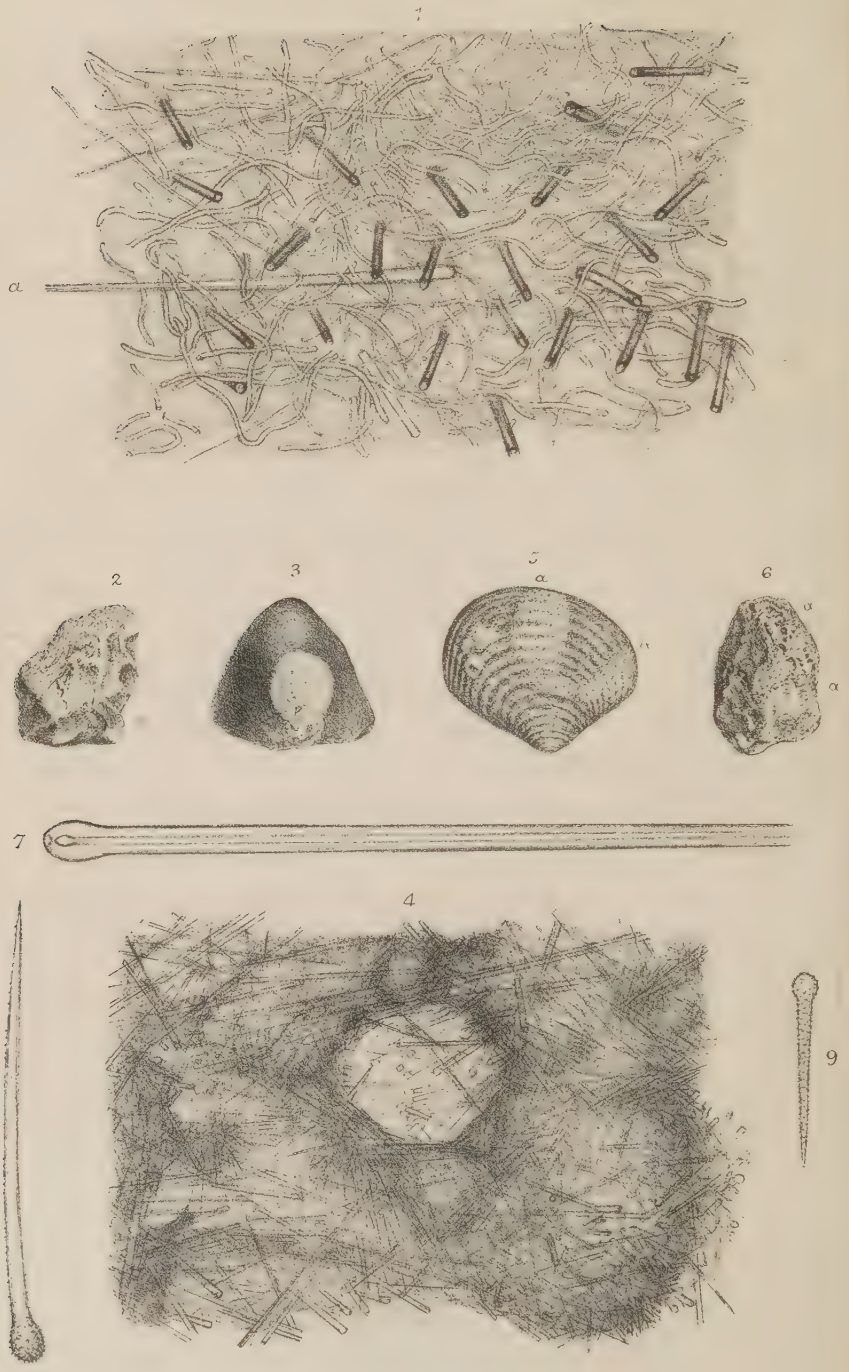
Fig. 7.—One of the angulated, bidentate-equianchorate, retentive spicula. × 530 linear.

Fig. 8.—One of the bidentate, palmate, equianchorate, retentive spicula. × 530 linear.

Fig. 9.—A section of the sponge at right angles to its surface. × 80 linear.

The arched appearance of the basal outline of the section is caused by the projecting ridges of the shell on which it is seated.

Plate XXVI.



Hymeraphia vermiculata 1–3.
H. clavata 4–9.

W. Lens Aldous del. et lith.

W. West & Co imp.

PLATE XXVI.

Hymeraphia vermiculata, *Bowerbank.*

Vol. ii, p. 141, 'Mon. Brit. Spongiadæ.'

Fig. 1.—A portion of the sponge exhibiting the basal membranes covered with its characteristic inequiacerate, vermiculoid spicula with the proximal ends of numerous long acuate skeleton spicula projecting from it at various angles to its surface, and one of the same description of spicula recumbent at a × 80 linear.

Fig. 2.—A small angular pebble from the deep sea, Shetland, by Mr. Barlee, having the whole of the upper surface (*a*) encrusted with the thin yellow sponge. Natural size.

Fig. 3.—Half of a bouldered pebble with a thin circular patch of the sponge upon it, from the same locality as No. 2. Natural size.

Vol. i, Plate I, fig. 5, represents one of the inequiacerate vermiculoid spicula. × 175 linear.

I am indebted to my friend Mr. Peach for many other specimens of this interesting sponge. The species appears to be by no means rare on pebbles and dead shells.

Hymeraphia clavata, *Bowerbank.*

Vol. ii, p. 143, 'Mon. Brit. Spongiadæ.'

Fig. 4.—A microscopical view of a portion of a sponge exhibiting the external surface and a portion of the basal membrane through an osculum. × 80 linear.

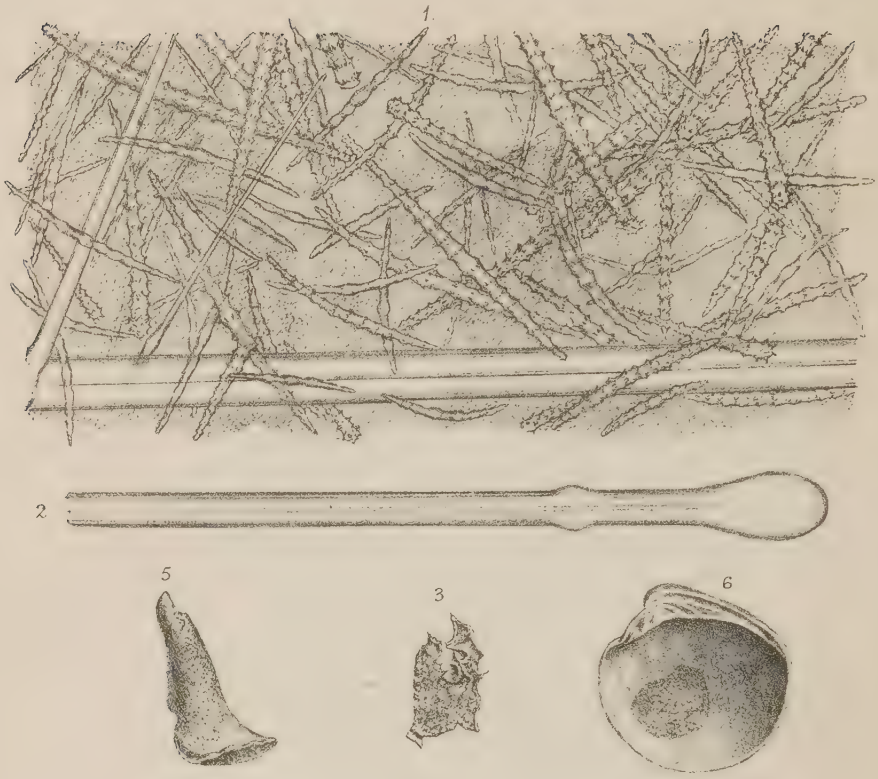
Fig. 5.—A sponge covering a portion of the outer

surface of a valve of Astarte scotica at *a a*. Natural size.

Fig. 6.—A sponge encrusting the greater portion of a small angular pebble, *a a* being the sponge. Natural size.

Fig. 7.—One of the large subclavate skeleton and external defensive spicula. × 250 linear.

Figs. 8 and 9.—Two of the attenuato-clavate, entirely-spined internal defensive spicula. × 250 linear. These spicula differ exceedingly in size, some of them being larger than the one represented by fig. 8.



Hymeraphia verticillata 1-3.
H. stellifera 4-6.

W. Lens Aldous del. et lith.
W. West & Co. imp.

PLATE XXVII.

HYMERAPHIA VERTICELLATA, *Bowerbank*.

Vol. ii, p. 145, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Magnified view of a small piece of the type-specimen of the sponge exhibiting the numerous fusiformi-cylindrical, verticillately spined spicula of the dermal membrane with a portion of the shaft of a very large skeleton spiculum. × 250 linear.

Fig. 2.—Represents the basal end of one of the large attenuato-clavate skeleton spicula. × 250 linear.

Fig. 3.—Represents the type-specimen of the sponge of the natural size.

Vol. i, Plate X, fig. 238, represents an adult verticillately-spined spiculum of the dermal membrane of the largest size. × 183 linear; and fig. 239 represents the incomplete development of the verticillately-spined spiculum in its moniliform state. × 183 linear.

Fig. 240 in the same plate exhibits the incissurate termination of one of the auxiliary skeleton spicula of H. verticellata. × 660 linear.

I received a small pebble from my friend Mr. Peach in a bottle with spirit, part of the results of his dredging at Shetland in the year 1864. On the top of the stone there was a small conical sponge, apparently a very young specimen of Hymeniacidon suberea, and on the side of the stone a thin patch of sponge very little exceeding the eighth of an inch in diameter. On removing this and mounting it in Canada balsam it proved to be a very young state of Hymeraphia verticillata. The remarkable spiculous

dermal membrane was well produced, but the rest of its organisation was scarcely developed sufficiently to characterise the species in a satisfactory manner.

Hymeraphia stellifera, *Bowerbank*.

Vol. ii, p. 146, 'Mon. Brit. Spongiadæ.'

Fig. 4.—A microscopical view of a portion of a sponge exhibiting the skeleton and external defensive spicula projected at various angles from the basal membrane and numerous internal, defensive, clavate, attenuato-cylindrical, internal, defensive spicula with stellately spinous apices, *in sitú*. × 80 linear.

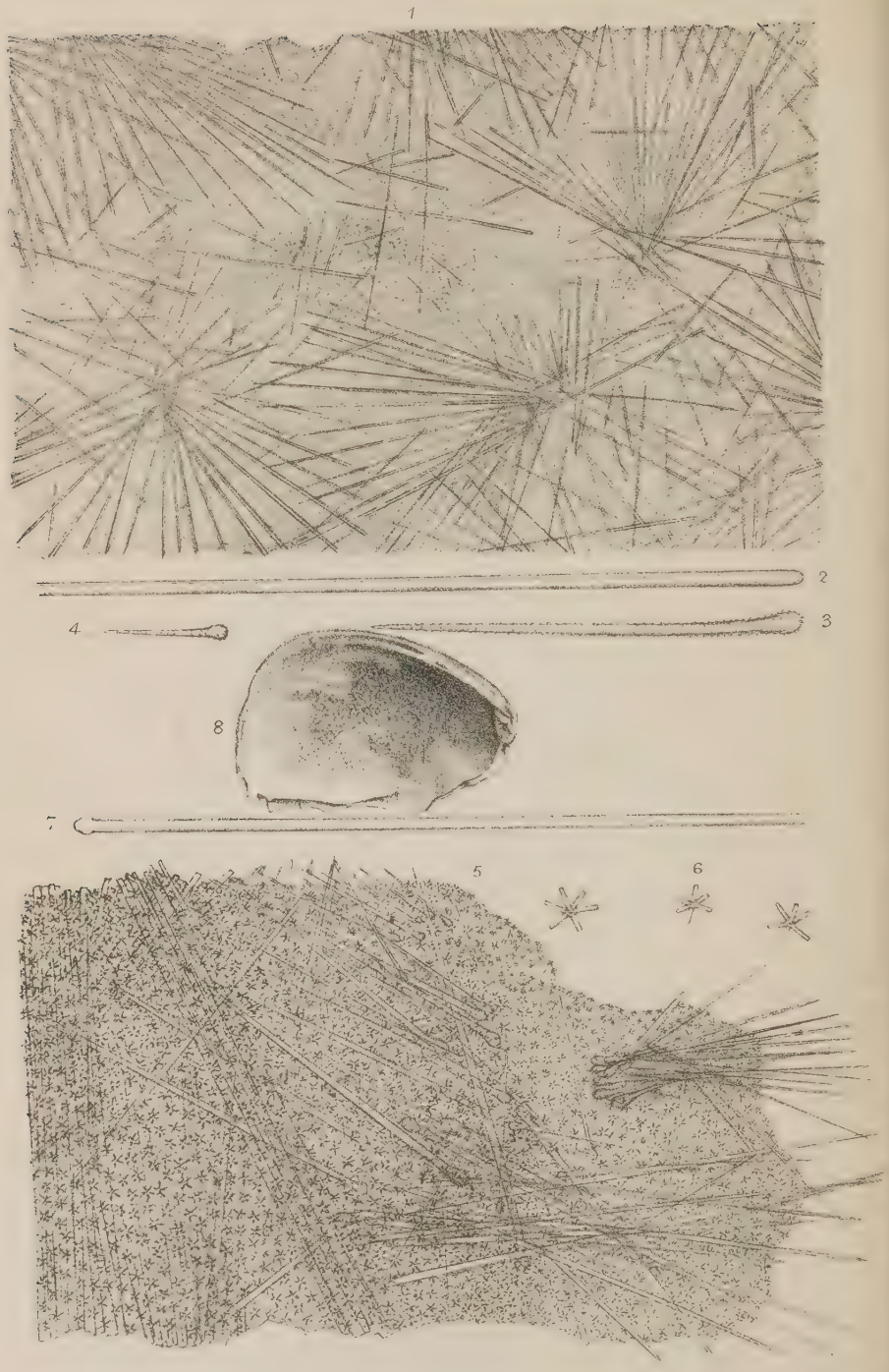
Fig. 5.—A portion of the columella of a Fusus completely encrusted by the sponge. Natural size. Deep sea, Shetland.

Fig. 6.—A small patch of the sponge on the inner surface of a valve of Docinia lincta. Natural size. Deep sea, Shetland.

Vol. i, Plate I, fig. 34, represents one of the clavato-attenuato-cylindrical, apically spined internal defensive spicula. × 260 linear.

Plate xxxiv, fig. 370, in the same volume exhibits a section at right angles to the basal membrane of a specimen of H. stellifera, with all its spicula *in sitú*. × 108 linear.

My indefatigable friend, Mr. Peach, when he accompanied Mr. J. G. Jeffreys in one of his North Sea dredging expeditions, obtained a considerable number of specimens of this sponge. It is by no means uncommon on dead shells and pebbles from 70 to 100 fathoms deep.



Hymedesmia radiata 1–4. H. stellata 5–8.

W. Lea Aldous del et lith.
W. West & Co. imp

PLATE XXVIII.

Hymedesmia radiata, *Bowerbank.*

Vol. ii, p. 149, 'Mon. Brit. Spongiadæ.'

Fig. 1.—A magnified view of a small portion of a sponge exhibiting the radiating groups of skeleton spicula *in situ*. × 80 linear.

Fig. 2.—The basal portion of one of the long and slender attenuato-acerate, skeleton spicula. × 128 linear.

Fig. 3.—One of the largest of the clavated attenuato-acerate, incipiently-spined, internal, defensive spicula. × 150 linear.

Fig. 4.—One of the smallest of the same description of spicula as that represented by fig. 3. × 150 linear.

For a representation of the sponge of its natural size, see Plate XVIII, fig. 8, of the present work.

This specimen exhibits the largest encrusted surface of this tribe of sponges that I have yet seen. The specimen was obtained among the deep sea dredgings at Shetland by my friend Mr. C. W. Peach in 1865.

Hymedesmia stellata, *Bowerbank.*

Vol. ii, p. 150, 'Mon. Brit. Spongiadæ.'

Fig. 5.—A portion of the type-specimen of H. stellata in the cabinet of the Rev. A. M. Norman, exhibiting the dermal membrane crowded with its minute cylindro-stellate spicula. × 123 linear.

Fig. 6.—A group of three of the cylindro-stellate spicula. × 530 linear.

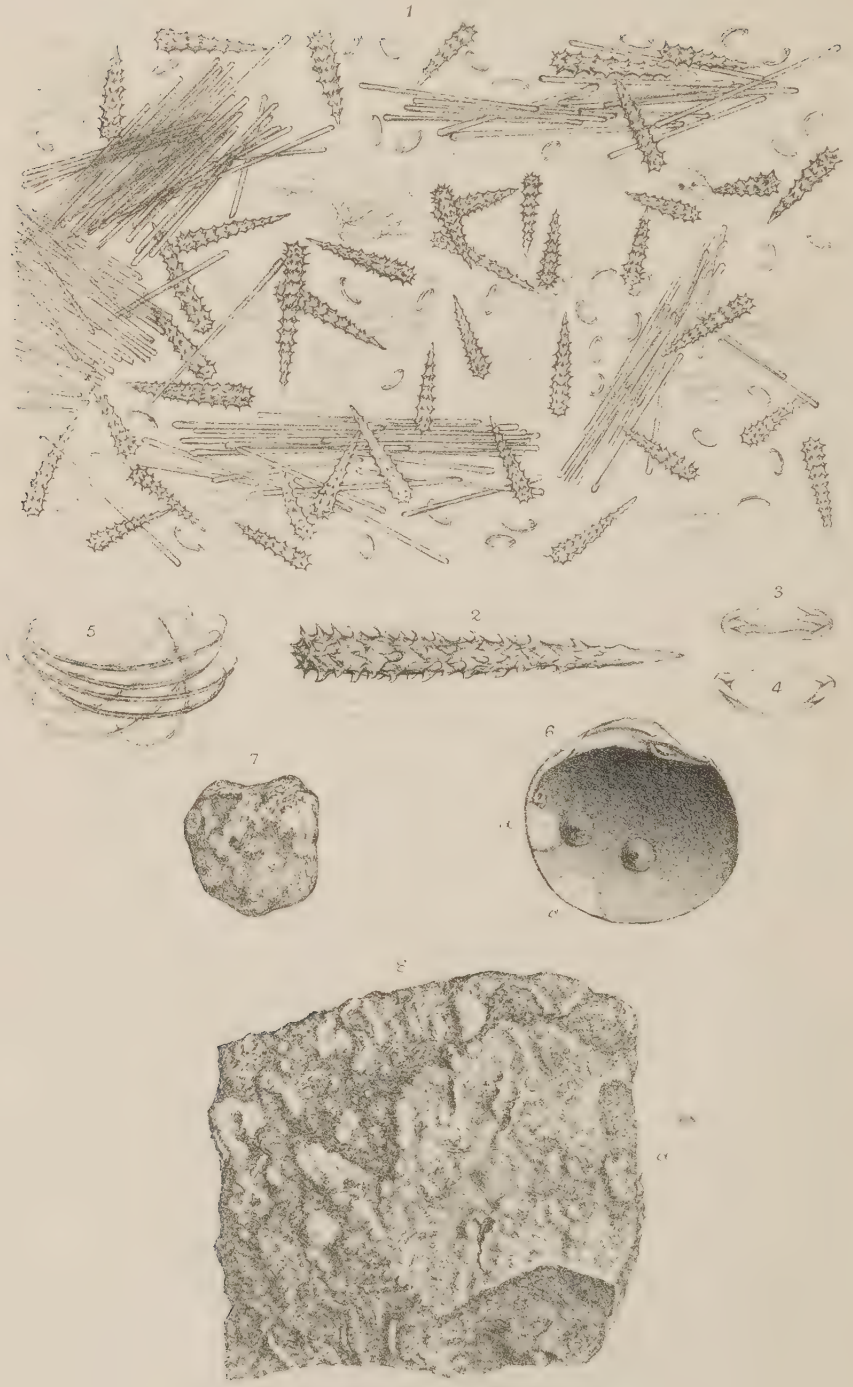
Fig. 7.—The basal portion of one of the ovo-spinulate skeleton spicula. × 150 linear.

Fig. 8.—A view of the type-specimen of the sponge of its natural size, the darkly-shaded portion representing the sponge.

Since the description of this species in vol. ii, 'Mon. Brit. Spongiadæ,' p. 150, I found two more specimens of this species among some small shells and fragments of shells sent to me by my indefatigable friend Mr. C. W. Peach, as the refuse of his Shetland dredging in 1866. The best of the two specimens coated a space a little exceeding two lines in diameter, of the inner surface of a valve of a *Pectunculus* not exceeding 5 lines in diameter. The portion of the specimen mounted in Canada balsam agreed in its structure, in every respect, with the type-specimen dredged by the Rev. Mr. Norman at Guernsey.

The second specimen was on a small flat fragment of shell. The sponge did not exceed a line and a half in diameter, and was evidently in an early stage of development. Both specimens were of a light fawn yellow colour in the dried state like the type one.

Plate XXIX.



Hymedesmia Zetlandica 1–7. H. radiata 8.

W. Lens Aldous del. et lith. W. West & Co. imp.

PLATE XXIX.

Hymedesmia Zetlandica, *Bowerbank*.

Vol. ii, p. 152, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a portion of the sponge from the specimen represented by fig. 6, exhibiting the fasciculated condition of the bi-clavated skeleton spicula, and of the simple bihamate groups, and the rest of the spicula, *in situ*. × 123 linear.

Fig. 2.—One of the attenuato-acuate, entirely-spined internal, defensive spicula. × 320 linear.

Fig. 3.—One of the tridentate, equi-anchorate, retentive spicula. × 530 linear.

Fig. 4.—A bidentate, equianchorate, retentive spiculum. × 530 linear.

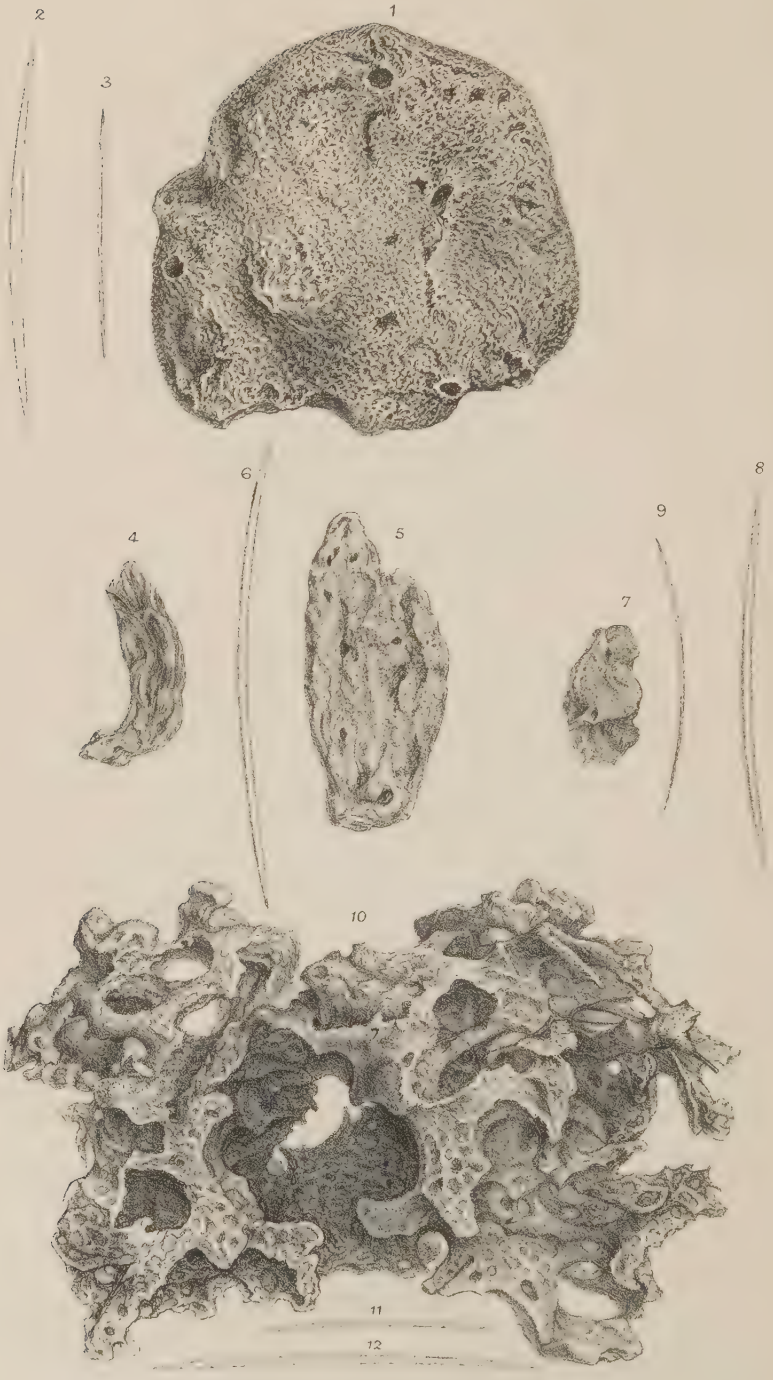
Fig. 5.—A group of simple bihamate retentive spicula. × 530 linear.

Fig. 6.—A valve of *Docinia exolita*, having two patches of the sponge on its inner surface at *a a*. There are also two small crania attached to the shell. Natural size.

Fig. 7.—A small pebble nearly covered by the encrusting sponge represented by the lightest tinted portion of the figure. Natural size.

Fig. 8.—Represents the specimen of Hymedesmia radiata described in page 149, vol. ii, 'Mon. Brit. Spongiadæ.' The large light-coloured patch opposite *a* being the sponge; the smaller light-coloured patches to the left hand in the specimen being calcareous. Natural size.

For the anatomical structures see Plate XXVIII in this volume.



Hymeniacidon Thomasii 1–3. H. coccinea 4–6.
H. Brettii 7–9. H. fragilis 10–12.

Lens Aldous del et lith.

W. West & Co imp.

PLATE XXX.

Hymeniacidon Thomasii, *Bowerbank.*

Vol. ii, p. 155, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen of the sponge in the dried state. Natural size.

Fig. 2.—One of the skeleton spicula. × 150 linear.

Fig. 3.—One of the slender acerate spicula of the interstitial membranes. × 150 linear.

Hymeniacidon coccinea, *Bowerbank.*

Vol. ii, p. 156, 'Mon. Brit. Spongiadæ.'

Fig. 4.—Represents the type-specimen of the species from Salcombe Bay, Devonshire, in the dried state. Natural size.

Fig. 5.—A larger specimen of the species from Jersey; in the cabinet of the Rev. A. M. Norman. In the dried state. Natural size.

Fig. 6.—One of the subfusiformi-acerate spicula of the skeleton. × 150 linear.

Hymeniacidon Brettii, *Bowerbank.*

Vol. ii, p. 158, 'Mon. Brit. Spongiadæ.'

Fig. 7.—The type-specimen of the species figured from the dried sponge. Natural size.

Fig. 8.—One of the fusiformi-acerate, skeleton spicula. × 150 linear.

Fig. 9.—A slender acerate spiculum of the dermal membrane. × 150 linear.

Since the description of the type-specimen I have

acquired three others which were found by Mrs. Brett at the same locality as the type one. One of them is one inch and two lines in length, and nine lines in breadth; the second one is rather less in size, and the third one about the size of the figured specimen. The oscula are more numerous in all the three, and are rather more elevated above the dermal surface of the sponge. In every other respects they agree very closely with the type-specimen.

Hymeniacidon fragilis, *Bowerbank.*

Vol. ii, p. 159, 'Mon. Brit. Spongiadæ.'

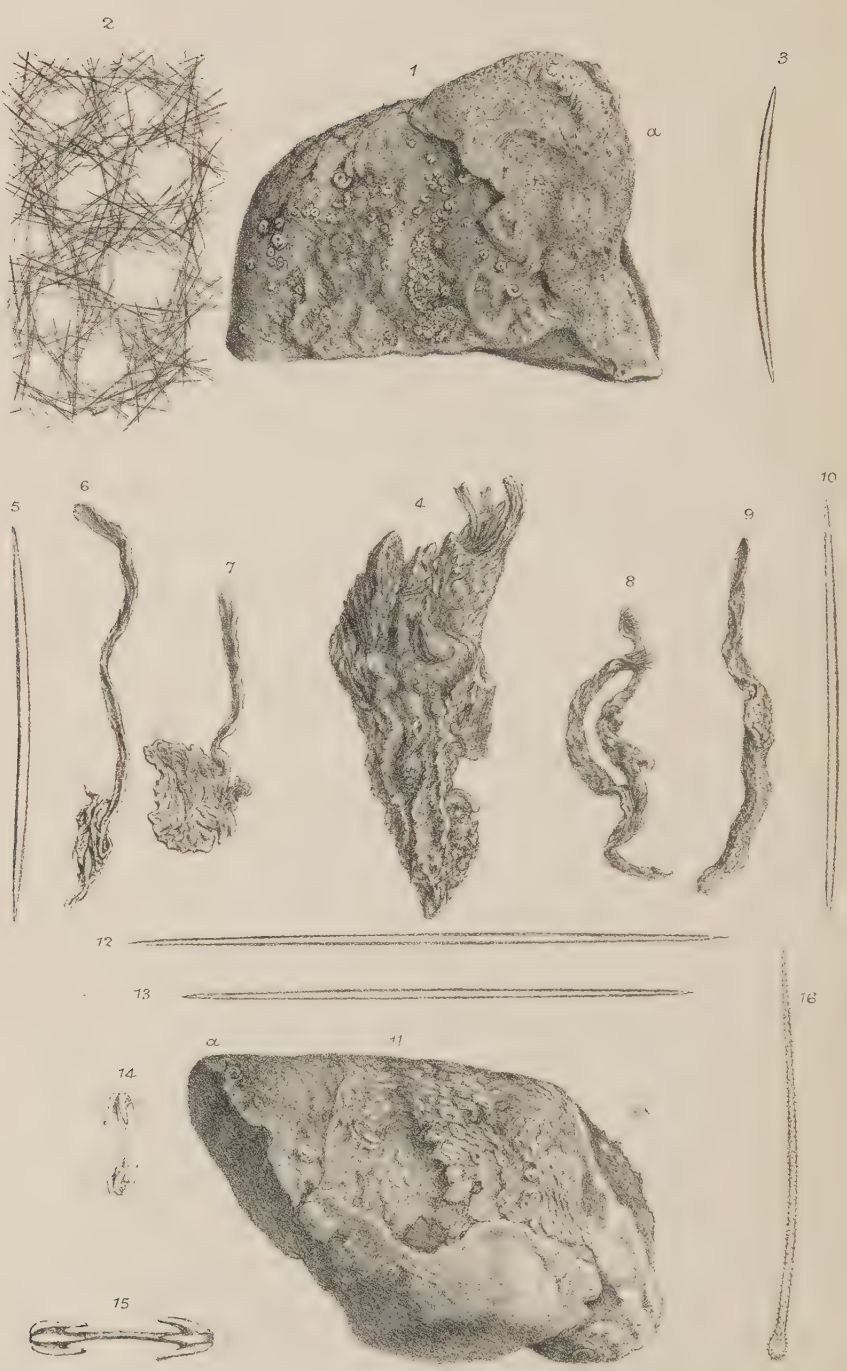
Fig. 10.—Represents an average-sized specimen of the sponge in the dried state of the natural size.

Fig. 11.—One of the slender fusiformi-acerate spicula of the dermal membrane. × 150 linear.

Fig. 12.—A fusiformi-acerate, stout, skeleton spiculum. × 150 linear.

This species appears to be very local in its habits. I found it near the mouth of the Dart about twenty-five years since, and I have never seen or heard of a specimen having been found in any other locality.

Plate XXXI.



Hymeniacidon reticulatus 1–3. H. fallaciosus 4 · 5.
H. albescens, 6–10. H. perarmatus 11–16.

W Lens Aldous del. et lith

W. West & C° imp.

PLATE XXXI.

HYMENIACIDON RETICULATUS, *Bowerbank.*

Vol. ii, p. 159, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen of the species on the surface of a portion of a flat bouldered stone at *a*, the remainder of the surface being covered with small shells and other matters. Natural size.

Fig. 2.—A small piece of the reticulated dermal membrane. × 123 linear.

Fig. 3.—One of the stout, acerate, skeleton spicula. × 150 linear.

The Rev. A. M. Norman dredged a specimen of this sponge at Jersey, and sent it to me for examination. It was preserved in spirit as it came from the sea. It consisted of two small sponges which had grown together at their bases. One was an inch in length by half an inch in width, and the other three quarters of an inch in diameter, and each about half an inch in height; and they had apparently been based on a rock or large stone. The colour was dull, ochreous yellow, with a tint of green. In the wet state no minute reticulation was visible on the surface. Each of them had three or four oscula on the upper surface, with slightly elevated margins varying from a line to a line and a half in diameter. The anatomical characters were in perfect accordance with those of the type-specimen, and the same variations in the perfect development of the beautiful dermal reticulation were visible.

Mr. W. Saville Kent dredged twelve specimens of this species off Guernsey in 1870; the largest did not exceed an inch and a half in length, and the greater

number were much smaller. In one of them the basal membrane is in a fine state of preservation. It is abundantly furnished with spicula, which are not arranged in a reticulation, as they are in the dermal membrane, but are thickly and irregularly felted together.

Hymeniacidon fallaciosus, *Bowerbank*.

Vol. ii, p. 160, 'Mon. Brit. Spongiadæ.'

Fig. 4.—Represents the type-specimen in the collection of the Rev. A. M. Norman. Natural size.

Fig. 5.—One of the stout acerate spicula of the skeleton.

Since the first publication of this species I have received a small specimen of it of an irregular, massive form, about half an inch in diameter. It was found by my friend Mr. C. W. Peach in, I believe, Fowey Harbour. I have also received five specimens in a bottle from Mr. Norman, labelled "Strangford Lough, tidemarks, October 8th, 1869." Among the five there was one undistinguishable by its external characters from the others, which proved, on microscopical examination, to be a specimen of *Hymeniacidon fallaciosus*. It was parasitical on the stems of a *Fucus*, embracing and binding four or five of the branches together into a mass irregularly cylindrical in shape, about an inch in length, and rather more than half an inch in diameter. The whole of the structural characters were in perfect accordance with those of the type-specimen.

Hymeniacidon albescens, *Bowerbank*.

Vol. ii, p. 161, 'Mon. Brit. Spongiadæ.'

Figs. 6, 7.—Specimens of the species from the Guliot Caves, Sark, with the basal sponge, whence the virgultose portion springs. Natural size.

Figs. 8, 9.—Specimens from Roundham Head,

Torbay, collected by Mr. Gosse. Fig. 8 represents the branching variety. Occasionally, but very rarely, there are as many as three branches. Natural size.

Fig. 10.—One of the large fusiformi-acerate spicula of the skeleton. × 150 linear.

Hymeniacidon perarmatus, *Bowerbank.*

Vol. ii, p. 164, 'Mon. Brit. Spongiadæ.'

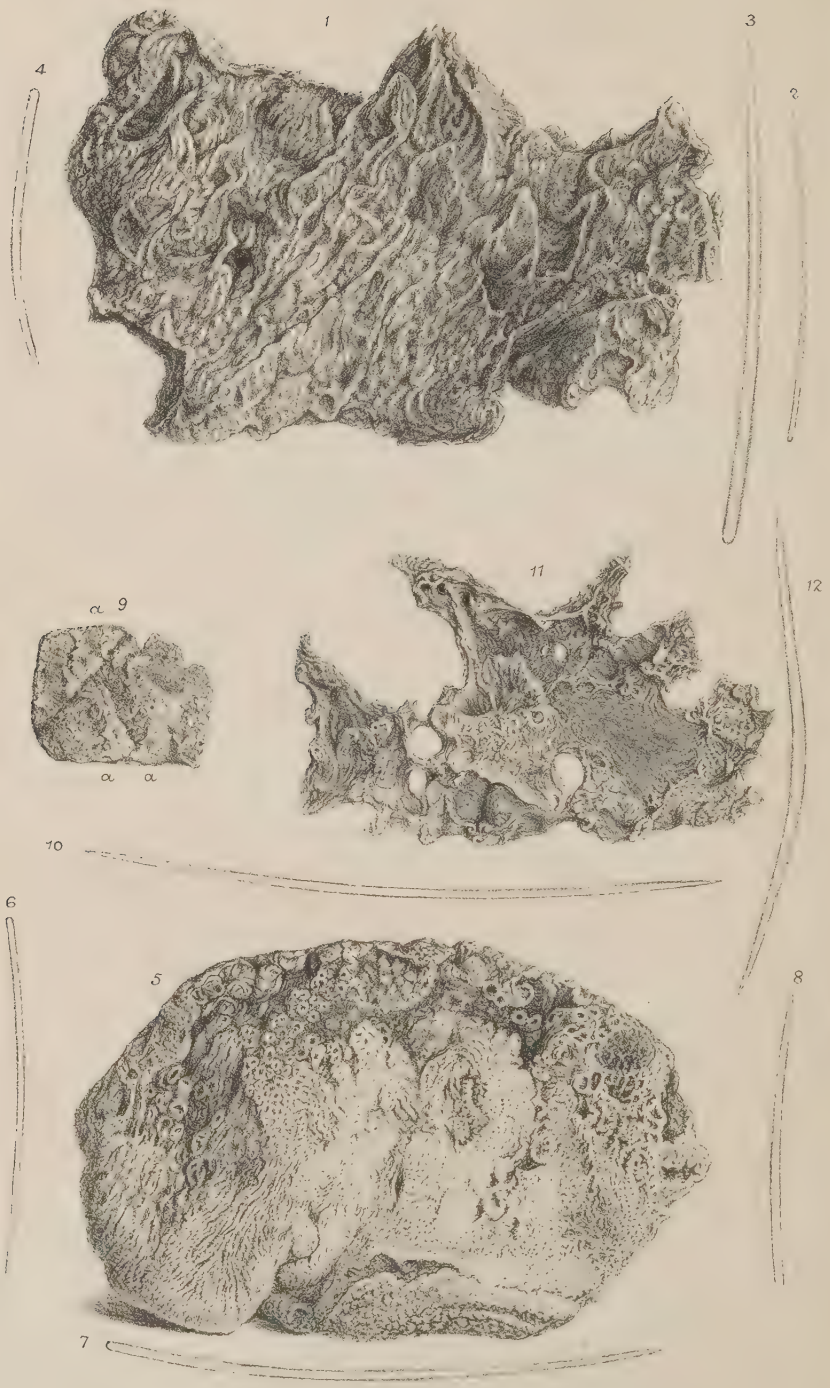
Fig. 11.—Represents the type-specimen in the collection of the Rev. A. M. Norman of the natural size. The front of the stone is covered by the sponge, excepting the angular space at (*a*). At nearly the middle of the sponge a few of the slightly elevated oscula are apparent as represented.

Figs. 12, 13.—Two of the large, acerate, skeleton spicula. × 150 linear.

Figs. 14, 15.—Two of the equianchorate, tridentate, retentive spicula, × 320 linear, representing about the largest and the smallest of these spicula.

Fig. 16.—An average-sized, attenuato-clavate, entirely-spined, internal, defensive spiculum. × 150 linear. They vary much in size, some being nearly twice the length of the one figured, while others are not above half the length of the figured one.

Plate XXXII.



Hymeniacidon caruncula 1–4. H. sanguinea 5–8.
H. lactea 9–10. H. membrana 11–12.

W. Lens Aldous del. et lith.

W. West & Co. imp

PLATE XXXII.

Hymeniacidon caruncula, *Bowerbank*.

Vol. ii, p. 166, 'Mon. Brit. Spongiadæ.'

Fig. 1.—An average-sized specimen of the species from St. Katherine's Cave, Tenby, from a dried specimen. Of the natural size.

Fig. 2.—One of the slender acuate spicula, from the dermal membrane. × 250 linear.

Fig. 3.—A large-sized skeleton spiculum. × 250 linear.

Fig. 4.—A small-sized skeleton spiculum. × 250 linear. The greater portion of the skeleton spicula are intermediate in size between figures 3 and 4.

Hymeniacidon sanguinea, *Bowerbank*.

Vol. ii, p. 168, 'Mon. Brit. Spongiadæ.'

Fig. 5.—Represents a specimen of the species from the Island of Boffin, Connemara, sent to me by the Rev. Robert Hudson. It is of about the average size and in the dried condition. Natural size.

Fig. 6.—One of the slender, acuate spicula, from the dermal membrane. × 250 linear.

Figs. 7 and 8.—Two of the skeleton spicula. × 250 linear. The spicula vary in size in every degree between the two figured ones.

I have also received a small specimen of this species from my friend Mr. C. W. Peach, who found it in Fowey Harbour in 1847.

Hymeniacidon lactea, *Bowerbank*.

Vol. ii, p. 163, 'Mon. Brit. Spongiadæ.'

Fig. 9.—Represents the type-specimen of the species from the Moray Frith, on a portion of an old Pecten shell. The patches of the sponge are represented by the lighter portions of the figure opposite the letter (*a*). Natural size.

Fig. 10.—One of the large acerate skeleton spicula. × 250 linear.

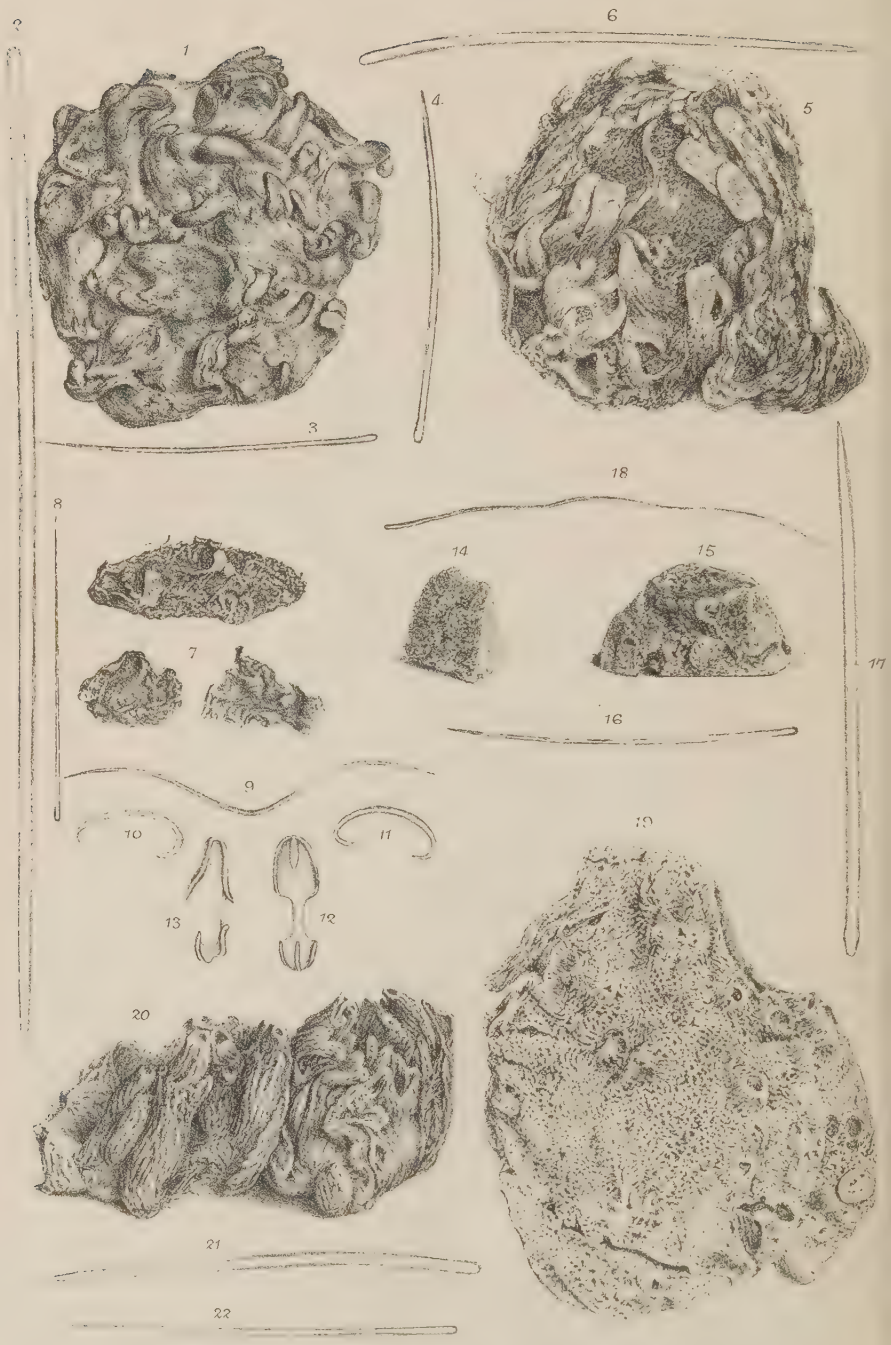
Since the description of the type-specimen in p. 163, vol ii, 'Mon. Brit. Spongiadæ,' I have acquired a very much larger and better developed specimen of the species. It covers by far the greater portion of the surface of the type-specimen of *Isodictya obscura* represented by fig. i, plate lxxiv, vol. iii, 'Mon. Brit. Spongiadæ.' Although developed to so much greater an extent than in the type-specimen, the sponge still exhibits the same thin paper-like structure that characterises the type one, and the milk white colour in the dried state is like that of the small patches of the sponge in the type-specimen. The anatomical structures of the two specimens are also in perfect accordance in all their essential characters, and the only difference is that in the larger specimen the interstitial structures are slightly more developed than in the type one, and therefore they exhibit the generic characters of the species in a more satisfactory manner.

Hymeniacidon membrana, *Bowerbank*.

Vol. ii, p. 165, 'Mon. Brit. Spongiadæ.'

Fig. 11.—Represents the type-specimen of the species in the cabinet of the Rev. A. M. Norman. The specimen is spread out on, and is adherent to, a piece of paper. Natural size.

Fig. 12.—One of the acerate, skeleton spicula. × 250 linear.



Hymenacidon mammeata 1–4. H. consimilis 5·6. H. macilenta 7–13. H. variantia 14. *(see Plate XLV. 32 - 34)* H. fallax 15–18. H. viridans 19–22.

W. Ivens Aldous del. et lith. W. West & Co. imp.

PLATE XXXIII.

Hymeniacidon mammeata, *Bowerbank.*

Vol. ii, p. 170, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 2.—One of the large, fusiformi, acuate, skeleton spicula. × 150 linear.

Fig. 3.—A slender, acuate, tension spiculum, from the dermal membrane. × 150 linear.

Fig. 4.—A fusiformi-acuate, external, defensive spiculum. × 150 linear.

Since the publication of this species, p. 170, vol. ii, I have obtained a fine specimen of it from the Diamond Ground, off Hastings. It is in the form of a compressed dried fig, two inches in diameter and half an inch in thickness at its distal portion, from which numerous mammæ are projected, varying in height from three to five lines, and about one line and a half in diameter near the base. The sponge is attached by about two thirds of its under surface to the external surface of a fragment of Pecten maximus.

Hymeniacidon consimilis, *Bowerbank.*

Vol. ii, p. 172, 'Mon. Brit. Spongiadæ.'

Fig. 5.—Represents the type-specimen of the species from Belgrave Bay, Guernsey. In the collection of the Rev. A. M. Norman. Natural size.

Fig. 6.—One of the skeleton spicula. × 150 linear,

Hymeniacidon macilenta, *Bowerbank.*

Fig. 7.—Three specimens of the species from the Island of Herm, by the Rev. A. M. Norman. Natural size.

By an oversight of the artist the skeleton spiculum of this species has been omitted in the Plate, but it so happens that the skeleton spiculum of *Hymeniacidon fallax*, represented by fig. 17 in the same plate, is of the like form and proportions as that of *H. macilenta*. I must therefore refer to that figure as a sufficient representative of the skeleton spiculum of the species in course of description.

Fig. 8.—One of the sub-clavate, acuate, slender, dermal, tension spicula. × 150 linear.

Fig. 9.—One of the slender, tricurvato-acerate, tension spicula of the dermal membrane. × 150 linear.

Figs. 10 and 11.—Two of the contort-bihamate retentive spicula. × 150 linear.

Fig. 12.—One of the inequi-dentato-palmate retentive spicula of the dermal membrane. × 530 linear.

Fig. 13.—An inequi-bidentate, retentive, spiculum from the dermal membrane. × 530 linear.

Hymeniacidon variantia, *Bowerbank.*

Vol. ii, p. 174, 'Mon. Brit. Spongiadæ.'

Fig. 14.—Represents the type-specimen of the species. Natural size.

The spicular illustrations required more space than could be assigned to them in the plate in which the sponge is figured in the order in which it is arranged in vol. ii. They will be found as follows in plate XLV of this volume.

Fig. 32.—A skeleton spiculum of the normal form and of the largest size. × 123 linear.

Fig. 33.—A smaller sized skeleton spiculum, exhibiting one of the very common forms of contorsion, which prevails among the smaller skeleton spicula. ... 123 linear.

Fig. 34.—Represents a small portion of the dermal membrane with its spicula *in situ* with loosely fasciculated, minute, acuate, tension, spicula, and the large and small bihamate, retentive spicula, irregularly dispersed. × 320 linear.

HYMENIACIDON FALLAX, *Bowerbank.*

Vol. ii, p. 177, 'Mon. Brit. Spongiadæ.'

Fig. 15.—Represents the type specimen of the species which I received from Mrs. Griffiths. Natural size.

Fig. 16.—One of the spicula of the dermal membrane. × 150 linear.

Fig. 17.—A skeleton spiculum. × 150 linear.

Fig. 18.—One of the slender, flexuous, tension spicula of the interstitial membranes. × 150 linear.

HYMENIACIDON VIRIDANS, *Bowerbank.*

Vol. ii, p. 178, 'Mon. Brit. Spongiadæ.'

Fig. 19.—Represents the type-specimen of the species in the Cabinet of the Rev. A. M. Norman. Natural size.

Fig. 20.—A specimen of the same species and from the same locality, for which I am indebted to Mr. Norman. Natural size.

Since the description of the type-specimen in vol. ii, p. 178, I have had the opportunity of examining several other specimens of the species. They appear to vary to a very considerable extent in size, form, and

colour. In fig. 19 it will be observed that the oscula are very slightly elevated above the dermal surface, while in the sponge represented by fig. 20 the entire surface is crowded with excurrent cloacæ. In fact the species appears to be almost as variable in form as that of Halichondria panicea.

Fig. 21.—One of the skeleton spicula. × 150 linear.

Fig. 22.—An acuate, slender spiculum, from the interstitial membranes. × 150 linear.

Mr. C. Stewart has also found this species rather thinly coating small boulders of stone at Plymouth.

Plate XXXIV.

Hymeniacidon perlevis 1. 2. H. crustula 3–6. H. aurea 7–9.
H. pachyderma 10-11. H. armatura 12–15.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE XXXIV.

Hymeniacidon perlevis, *Bowerbank*.

Vol. ii, p. 179, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the specimen of the species presented to me by the late Mrs. Griffiths, who obtained it from a Torbay fisherman. Natural size.

Fig. 2.—One of the skeleton spicula. × 150 linear.

Hymeniacidon crustula, *Bowerbank*.

Vol. ii, p. 185, 'Mon. Brit. Spongiadæ.'

Fig. 3.—Represents the largest and finest specimen of the species that I have seen, dredged on the Diamond Ground, off Hastings. It exhibits the deep depression in which numerous oscula are congregated. Natural size.

Fig. 4.—One of the large fusiformi-acuate skeleton spicula. × 150 linear.

Fig. 5.—A slender fusiformi-acuate, tension spiculum. × 150 linear.

Fig. 6.—One of the fusiformi-acuate spicula from the dermal crust of the sponge. × 150 linear.

Hymeniacidon aurea, *Bowerbank*.

Vol. ii, p. 181, 'Mon. Brit. Spongiadæ.'

Fig. 7.—Represents one of the specimens which I obtained at Tenby, covering the greater portion of the surface of the shell and its parasites. Natural size.

Fig. 8.—One of the sub-fusiformi-acuate skeleton spicula. × 150 linear.

Fig. 9.—One of the slender flexuous tension spicula of the dermal membrane. × 150 linear. These spicula assume every imaginable form of flexuousness.

I am indebted to Professor Dickie, of Aberdeen, for six specimens of this sponge from Lough Larne. They agree in all their structural peculiarities with the specimens previously described.

Hymeniacidon pachyderma, *Bowerbank.*

Vol. ii, p. 184, 'Mon. Brit. Spongiadæ.'

Fig. 10.—Represents the type-specimen of the sponge presented to me by Mrs. Griffiths. Natural size.

Fig. 11.—One of the skeleton spicula of the sponge. × 150 linear.

Hymeniacidon Armatura, *Bowerbank.*

Vol. ii, p. 183, 'Mon. Brit. Spongiadæ.'

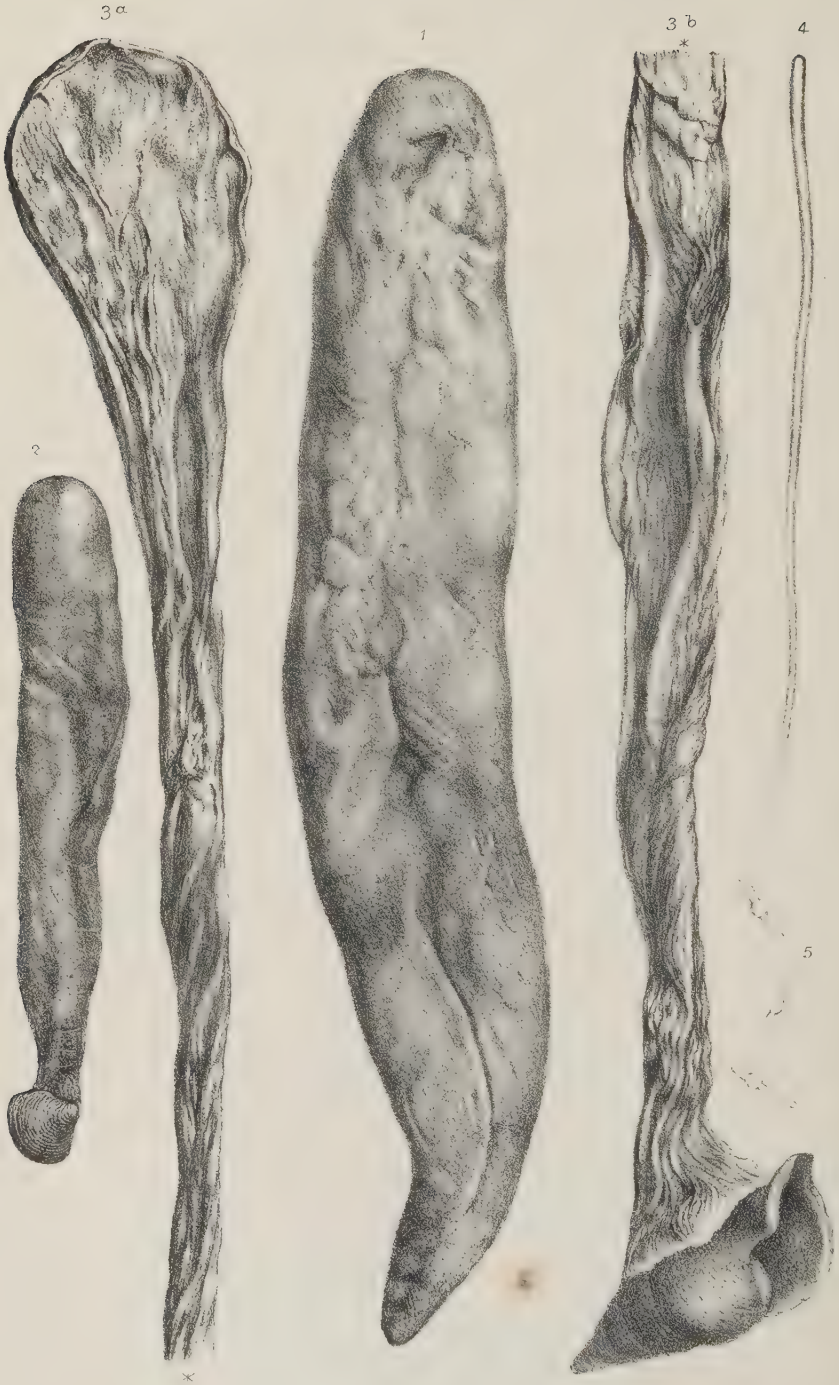
Fig. 12.—Represents the type-specimen from Strangford Lough. Natural size.

Fig. 13.—One of the acuate skeleton spicula. × 250 linear.

Fig. 14.—One of the cylindrical spicula from the dermal membrane. × 250 linear.

Fig. 15.—One of the attenuato-acuate, entirely-spined, internal, defensive spicula. × 530 linear.

Plate XXXV.



Hymeniacidon virgultosa.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE XXXV.

Hymeniacidon virgultosa, *Bowerbank.*

Vol. ii, p. 193, 'Mon. Brit. Spongiadæ.'

In vol. ii I have described this species of sponge as parasitical on Zoophytes or Fuci Since then I have received more than a dozen fine specimens from Mr. Cullen of Scarborough, none of which exhibited any signs of Zoophytes or Fuci within them.

I have also received a specimen of the species from Mr. Jonathan Couch in the form of a flat mass $3\frac{1}{2}$ inches long, 2 inches wide, and not exceeding half an inch in thickness. In external appearance it is so like H. suberea that it is only by a microscopical examination that it can be separated from that species.

Fig. 1.—Represents a specimen in the wet condition as it came from the sea. It has quite a fleshlike softness and is very flexible, and there are no signs of an attachment at its smaller or basal end. It is probable that it had been accidentally detached from its natural base, and had been floating freely about for some time before it was dredged up. Natural size.

Fig. 2.—Is a smaller specimen of the species based on a small bivalve shell. The figure is from the sponge in the wet condition as it came from the sea, fleshy and flexible as the larger one. Natural size.

Fig. 3 *a* and *b*.—Represents the basal and distal extremities of the same specimen, which is 39 inches in length ; the 25 inches not represented in the plate possess precisely the same characters as the figured portions of the stem, gradually attenuating from the distal termination of the basal portion to the proximal end of the distal portion of the sponge. This very

remarkable specimen is in a fine state of preservation, and it is probable that the species is of rapid growth as the shell, *Fusus Islandicus* ? is in as fresh a state as if the animal had but recently been living in it; the periostracum being in a perfect state of preservation. The spoon-shaped expansion of the distal extremity of the sponge is the only instance of the assumption of such a form among the species that I have yet seen. The figures are from the dried specimen of the natural size.

Fig. 4.—One of the skeleton spicula. × 250 linear.

Fig. 5.—A group of three of the inflato-cylindrical spicula of the dermal membrane. × 530 linear.

an elongated pedestal and has apparently been separated from its basal attachment while alive. Natural size.

Fig. 8.—One of the long slender skeleton spicula. × 150 linear.

Fig. 9.—One of the small slender spinulate spicula of the interstitial membranes. × 150 linear.

Hymeniacidon ficus, *Bowerbank.*

Vol. ii, p. 206, 'Mon. Brit. Spongiadæ.'

Fig. 10.—A very fine mature specimen of the species on the outer surface of half of an old bivalve shell. I dredged it in Gilter Sound, near Tenby; it is of a compressed form like that of a dried fig, not exceeding about five eighths of an inch in thickness. Natural size.

Fig. 11.—A small specimen which has apparently been based on a univalve shell which it has entirely enveloped from the Island of Harris, Hebrides, by Captain Thomas, R.N. Natural size.

Fig. 12.—A specimen entirely enveloping a small univalve shell from the coast of Scotland by Mr. C. W. Peach. Natural size.

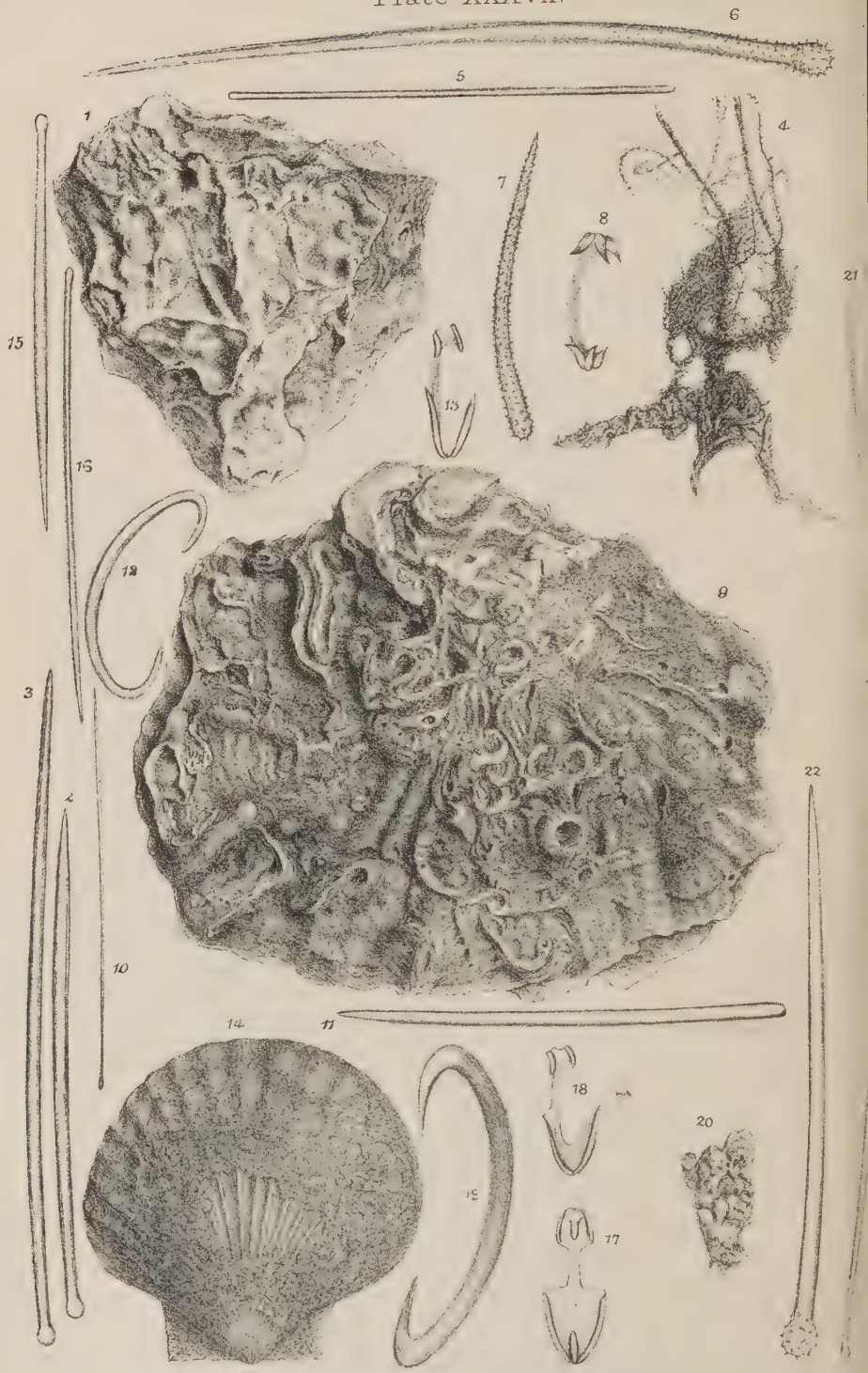
Fig. 13.—A spinulate, skeleton spiculum. × 150 linear.

Fig. 14.—An acuate, skeleton spiculum. × 150 linear.

Fig. 15.—A sub-attenuato, acuate, slender spiculum of the interstitial membranes. × 150 linear.

Fig. 16.—One of the minute inflato-cylindrical spicula of the dermal membrane. × 150 linear. To give an idea of the relative size of these spicula as compared with those of the skeleton. × 150 linear.

Fig. 17.—The same spiculum. × 530 linear.



Hymeniacidon sulphurea 1–3. H. paupertas. 4–8. H. subclavata 9–13.
Raphiodesma floreum 14–19. Hymeniacidon clavigera 20–22.

W. Lees Aldous del. et lith. W. West & C° imp.

PLATE XXXVII.

Hymeniacidon sulphurea, *Bowerbank.*

Vol. ii, p. 208, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen presented to me by Mr. Bean, of Scarborough. Natural size.

Fig. 2.—One of the skeleton spicula. × 250 linear.

Fig. 3.—A tension spiculum of the dermal membrane. × 250 linear.

Hymeniacidon paupertas, *Bowerbank.*

Vol. ii, p. 223, 'Mon. Brit. Spongiadæ.'

Fig. 4.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 5.—One of the sub-fusiformi cylindrical spicula of the dermal membrane. × 250 linear.

Fig. 6.—An attenuato-clavate, basally-spined skeleton spiculum. × 250 linear.

Fig. 7.—One of the attenuato-clavate, internal, defensive spicula. × 250 linear.

Fig. 8. — An expando-tridentate, equi-anchorate, retentive spiculum. × 530 linear.

Hymeniacidon subclavata, *Bowerbank.*

Vol. ii, p. 209, 'Mon. Brit. Spongiadæ.'

Fig. 9.—Represents the type-specimen of the species from Tenby. Natural size.

Fig. 10.—One of the slender fusiformi-subclavate spicula from the dermal membrane. × 250 linear.

Fig. 11.—One of the skeleton spicula. × 250 linear.

Fig. 12.—A contort, bihamate, retentive spiculum. × 530 linear.

Fig. 13.—One of the minute, bidentate, inequi-anchorate, retentive spicula. × 530 linear.

Raphiodesma floreum, *Bowerbank.*

Hymeniacidon floreum. Vol. ii, p. 190, 'Mon. Brit. Spongiadæ.'

Fig. 14.—Represents the type-specimen from East Loch, Tarbet Harris, N.B., presented to me by Capt. F. W. L. Thomas, R. N. Natural size.

Fig. 15.—One of the skeleton spicula. × 250 linear.

Fig. 16.—A subclavate, fusiformi-acerate, tension spiculum from the dermal membrane. × 250 linear.

Fig. 17.—One of the large dentato-palmate, inequianchorate, retentive spicula. × 530 linear. The mode of the congregation of these spicula is represented in vol. i, plate xviii, fig. 297, as they occur in *Hymeniacidon lingua* of that volume.

Fig. 18.—One of the bidentate, inequianchorate, retentive spicula. × 530 linear.

Fig. 19.—A large contort, bihamate spiculum. × 530 linear.

This sponge was figured among the Hymeniacidons before I had established the genus *Raphiodesma* for the reception of *R. lingua* and *R. sordida*, to both of which species *R. floreum* is closely allied by its structural peculiarities.

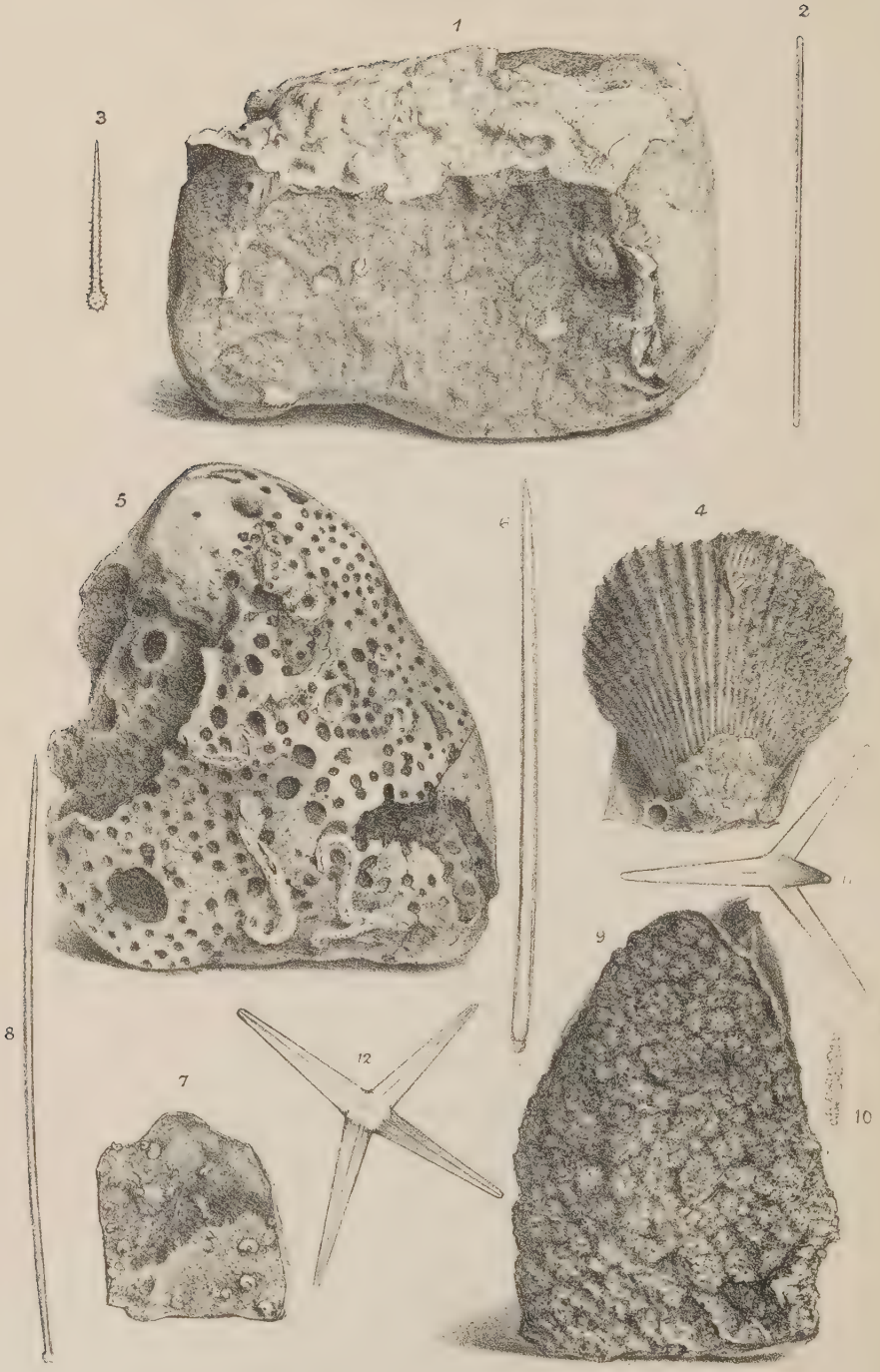
Hymeniacidon clavigera, *Bowerbank.*

Vol. ii, p. 211, 'Mon. Brit. Spongiadæ.'

Fig. 20.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 21.—One of the large, attenuato-clavate, or spinulate, skeleton spicula. × 80 linear.

Fig. 22.—An attenuato-clavate, entirely-spined, internal, defensive spiculum. × 250 linear. The spination of the shaft of this spiculum has been accidentally omitted.



Hymeniacidon Dujardinii 1–4. H. celata 5–6.
H. gelatinosa 7–8. H. Bucklandi 9–12.

W. Lens Aldous del. et lith. W. West & C° imp

PLATE XXXVIII.

Hymeniacidon Dujardinii, *Bowerbank.*

Vol. ii, p. 224, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the specimen found about two miles north of Scarborough. Natural size. The dark front surface represents the sponge; the upper white surface is *Nullipora polymorpha.*

Fig. 2.—One of the skeleton spicula. × 250 linear.

Fig. 3.—One of the internal defensive spicula. × 250 linear.

Fig. 4.—A valve of *Pecten varius*, the greater portion of which is covered with *H. Dujardinii.* From Tenby. Natural zize.

Hymeniacidon celata, *Bowerbank.*

Vol. ii, p. 212, 'Mon. Brit. Spongiadæ.'

Fig. 5.—Represents a small boulder of limestone from Tenby, with innumerable perforations, each of which is occupied by *H. celata.* Natural size.

Fig. 6.—An average-sized skeleton spiculum. × 350 linear.

Halichondria gelatinosa, *Bowerbank.*

Vol. ii, p. 222, 'Mon. Brit. Spongiadæ.'

Fig. 7.—Represents the type-specimen from Dourie Voe, Shetland. Natural size.

Fig. 8.—A full-sized spinulate skeleton spiculum. × 123 linear.

Hymeniacidon Bucklandi, *Bowerbank.*

Vol. ii, p. 226, 'Mon. Brit. Spongiadæ.'

Fig. 9.—Represents the specimen from the rocks of

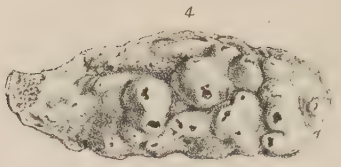
Abbey Bay, near Torquay, in its natural condition, as preserved in salt and water. Natural size.

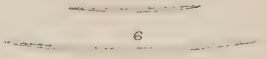
Fig. 10.—One of the minute, entirely spined, cylindrical spicula from the dermal membrane. × 1050 linear.

Fig. 11.—A spiculated triradiate spiculum from the skeleton. × 80 linear.

Fig. 12.—One of the attenuated biangulated skeleton spicula. × 80 linear.

Plate XXXIX.





. Halichondria panicea.

W. Lens Aldous del. et lith. W. West & C° imp.

PLATE XXXIX.

HALICHONDRIA PANICEA, *Johnston*.

Vol. ii, p. 229, 'Mon. Brit. Spongiadæ.'

I have devoted two plates to the illustration of this remarkably protean sponge, not only because it varies in its form and habit to an extraordinary extent according to differences in the nature of its localities and other circumstances attending its growth and development, but also as a general illustration of the little dependence that can be placed on the characters of form and colour in the specific descriptions of these extraordinary animals.

The variations in form influence also other important specific and anatomical characters. Thus, in figs. 1 and 2, Plate XXXIX, the anatomical and physiological characters are modified in accordance with its peculiarities of form.

The oscula, which, in its massive forms, are on its external surface as in figs. 3, 4, and 5, are in figs. 1 and 2 within the large cloacal tubes, and this appears to be always the case where the sponge puts forth such organs. This necessarily modifies the arrangement of interstitial canals and cavities. Such an extreme variation in form and structure, forcibly illustrates the futility of depending on external form in the discrimination of species, and teaches us, that our only safe guides are to be found in their anatomical structures.

This great range of variation of form necessarily leads to a simulation of other sponges of a totally different anatomical structure, and this is well illustrated by a comparison of fig. 4 in Plate XXXIX with that of *Isodictya indistincta*, Plate LI, fig. 2, in the present volume, and of *Ophlitaspongia papillata*, Plate LXXXI, fig. 1.

Fig. 1.—Represents a specimen which has developed itself in the form of a singular large fistula with a few

irregular nodular masses near its base. The oscula of the large fistula are disposed on its inner surface, a few minute ones are discernible on the basal nodules. The sponge has apparently been based on a fucus, part of which remains at (*a*). The figure is half the natural size.

Fig. 2.—Another case in which the sponge has assumed the fistulous form and developed two fistulæ in conjunction. Natural size.

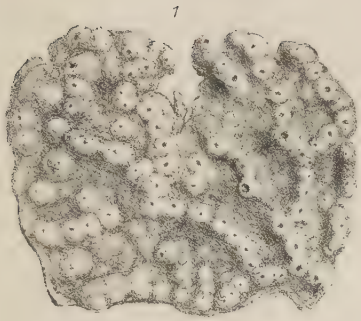
Fig. 3.—A case in which the sponge, based on a small univalve shell (*b*), is developed in a massive state in the form of an irregular upright column, the oscula, as usual in the massive forms of the sponge, being dispersed on the external surface. Natural size.

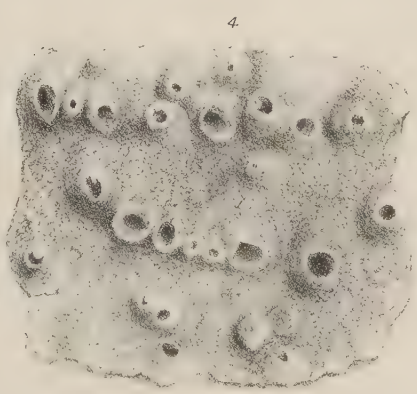
Fig. 4.—A specimen based on a solid irregular surface; small nodular masses are projected from the upper surface, on each of which one or more oscula are developed. Natural size.

Fig. 5.—An irregular nodular mass pendant from a slender stem of a fucus (*c*), which it entirely surrounds, the nodules being developed equally on all sides, each being supplied with one or more simple oscula. Natural size.

Fig. 6 —Two of the skeleton spicula × 80 linear, exhibiting their variation in size, the larger one being the most numerous.

Plate XL.





Halichondria panicea.

W. Lens Aldous del. et lith.

W. West & Co imp

Univ. of Arizona Library

PLATE XL.

Halichondria panicea.

Vol. ii, p. 229, 'Mon. Brit. Spongiadæ.'

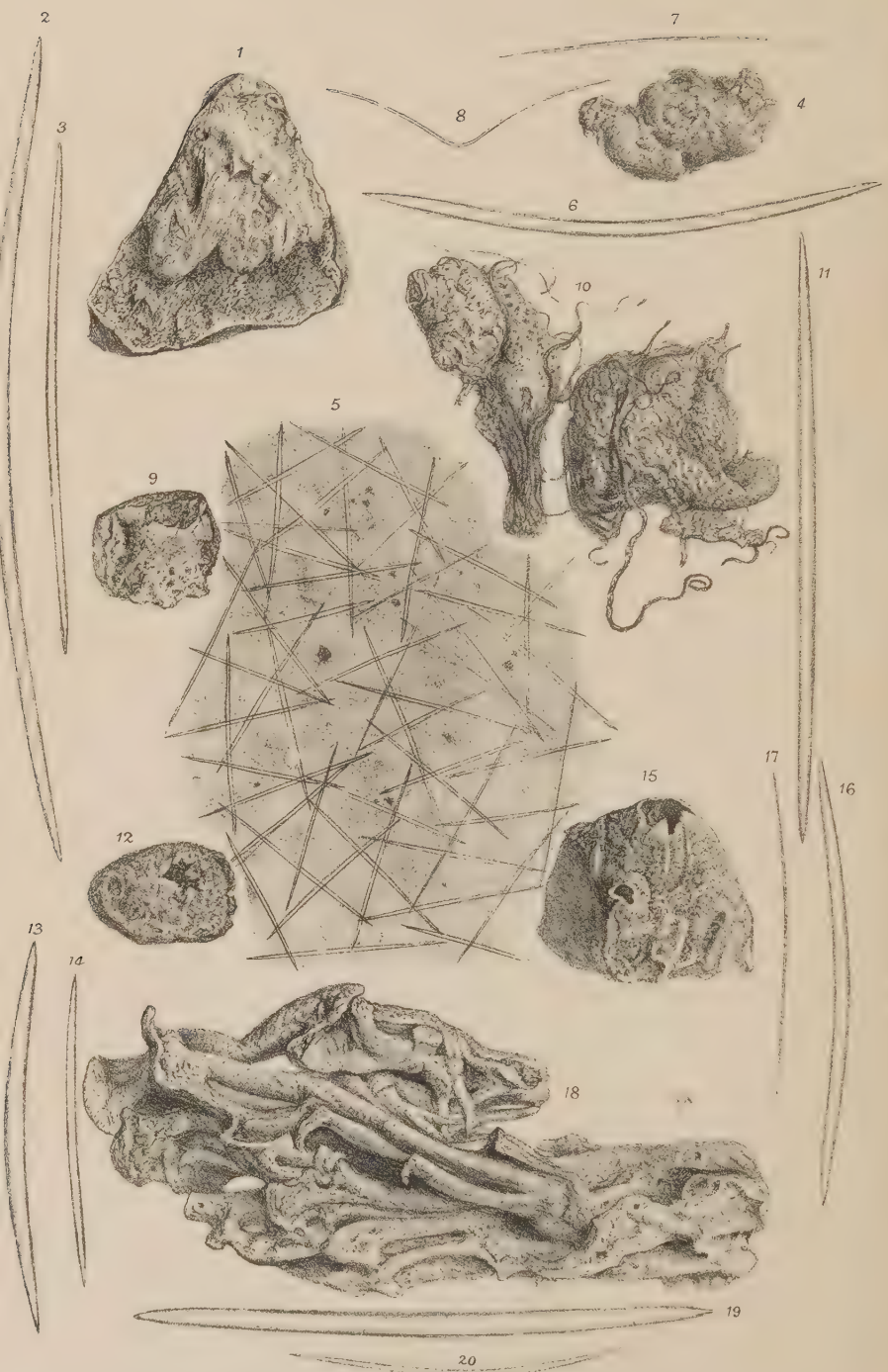
Figs. 1, 2, 3, 4, are all from St. Catherine's Cave at Tenby. The varieties in their form illustrate in a very striking manner the slight differences in position even in the same locality that appears to determine their modes of development. Figs. 1, 3, and 4, are each uniform in the development of their oscular organs, but fig. 2 is remarkable as combining so many forms of their development, proving that position alone will not determine them to a uniformity of development.

Fig. 5.—Represents the remarkable variety in form of the species that is described by Ellis in his 'History of Zoophytes,' p. 186, and which was published by him in the 'Philosophical Transactions,' vol. 55, p. 228, Tab. 4, fig. G, under the designation of Cockscomb sponge, and which he states "grows in the rocks to the eastward of Hastings, in Sussex. The common size of it is about three inches long and two inches high." The specimen figured is from the locality named by Ellis.

The reader must not imagine that the numerous and singular varieties of form that have been figured in the two plates illustrating the species are the whole that might have been represented; numerous others intermediate between those that have been figured are readily to be found where the species abounds, and in truth it may be said that it has no definite specific form.

In vol. 1, Plate XIX, fig. 300, a section at right angles to the surface is figured showing the intermarginal cavities immediately beneath the dermal surface and the irregular disposition of the skeleton, and in fig. 303 in the same plate a portion of the dermal membrane is represented with the reticulations and pores in the areas in an open condition.

Plate XLI.



Halichondria glabra 1–3. H. angulata 4–8. H. caduca 9–11.
H. inconspicua 12–14. H. incerta 15–17. H. coalita 18–20.

W. Lens Aldous del. et lith. W. West & Co. imp.

PLATE XLI.

Halichondria glabra, *Bowerbank.*

Vol. ii, p. 232, 'Mon. Brit. Spongiadæ.'

Fig. 1.—A specimen of the species from Scarborough. Natural size, the lighter and upper portion of the figure representing the sponge.

Fig. 2.—A fully-developed skeleton spiculum. × 250 linear.

Fig. 3.—An immature skeleton spiculum. × 250 linear. Intermediate sizes between figs. 2 and 3 are of frequent occurrence.

Halichondria angulata, *Bowerbank.*

Vol. ii, p. 233, 'Mon. Brit. Spongiadæ.'

Fig. 4. — Represents the type-specimen from Guernsey in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 5.—A small piece of the dermal membrane, exhibiting the structure of its unispiculous network. × 80 linear.

Fig. 6.—One of the skeleton spicula. × 250 linear.

Fig. 7.—A small and slender acerate, tension spiculum. × 250 linear.

Fig. 8. — One of the subangulated, tricurvate acerate, tension spicula. × 530 linear.

Halichondria caduca, *Bowerbank.*

Vol. ii, p. 234, 'Mon. Brit. Spongiadæ.'

Fig. 9. — Represents the type-specimen from the northern side of St. Catherine's rock, at Tenby, in the dried state. Natural size.

Fig. 10. — Represents two larger and more fully developed specimens preserved in spirit from Guernsey. In the cabinet of the Rev. A. M. Norman. Natural

size. The two specimens are connected by the fibres of the Zoophyte on which they have grown.

Fig. 11.—A skeleton spiculum. × 250 linear.

The Rev. A. M. Norman found this species at Strangford Lough, October 8th, 1869. The specimens were preserved in spirit as they came from the sea. They were of a dark-green colour, and were remarkably soft and flexible.

Halichondria inconspicua, *Bowerbank.*

Vol. ii, p. 236, 'Mon. Brit. Spongiadæ.'

Fig. 12.—Represents the type-specimen from St. Catherine's Rock, at Tenby. Natural size.

Fig. 13.—One of the skeleton spicula. × 250 linear.

Fig. 14.—A tension spiculum from the interstitial membranes. × 250 linear.

Halichondria incerta, *Bowerbank.*

Vol. ii, p. 237, 'Mon. Brit. Spongiadæ.'

Fig. 15.—Represents the type-specimen from Guernsey thinly coating a balanus. In the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 16.—One of the acerate, skeleton spicula. × 250 linear.

Fig. 17.—One of the slender, acerate, tension spicula, from the dermal membrane. × 250 linear.

Halichondria coalita, *Johnston.*

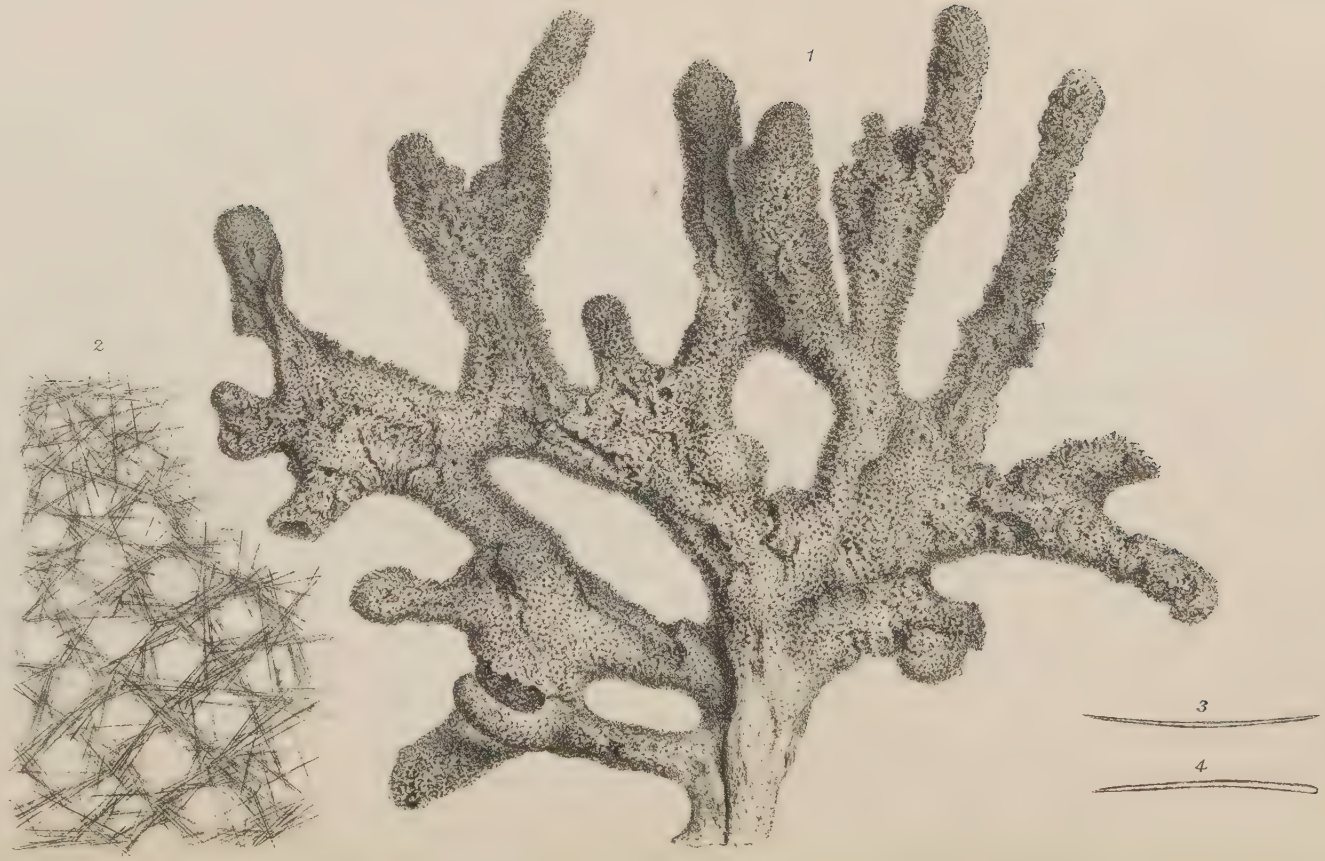
Vol. ii, p. 238, 'Mon. Brit. Spongiadæ.'

Fig. 18.—Represents the specimen from Sheppey presented to me by Dr. Grant. Natural size.

Fig. 19.—One of the skeleton spicula. × 250 linear.

Fig. 20.—One of the subfusiformi, acerate spicula, from the dermal membrane. × 250 linear.

Plate XIII.



Halichondria distorta.

W. Lens Alous del. et lith.

W. West & Co imp.

PLATE XLII.

HALICHONDRIA DISTORTA, *Bowerbank.*

Vol. ii, p. 240, 'Mon. Brit. Spongiadæ.'

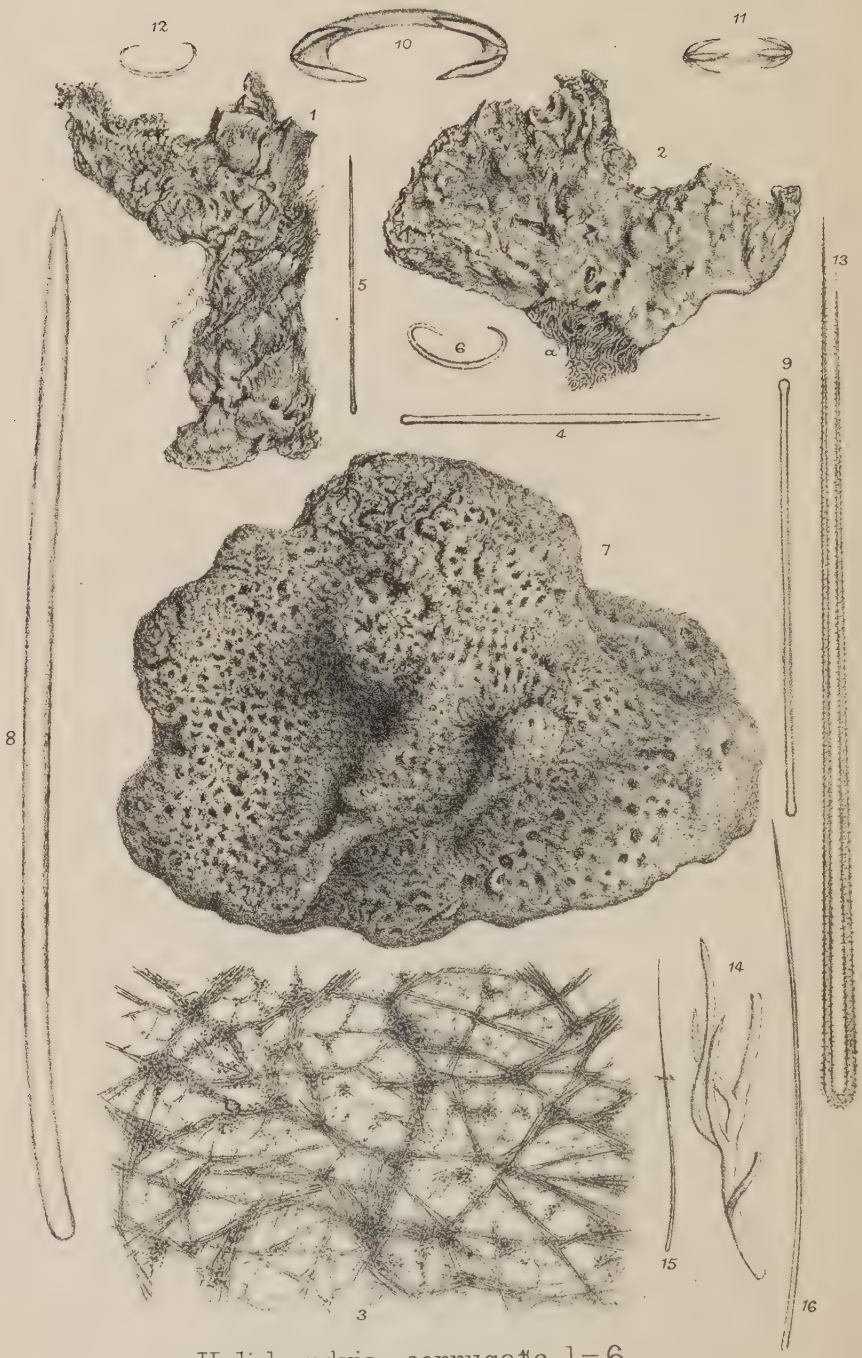
Fig. 1.—Represents the specimen presented to me by Mrs. Griffiths, obtained from the Brixham Trawler. Natural size.

Fig. 2.—From a small portion of the dermal membrane, exhibiting the polyspiculous network of that organ. × 80 linear.

Fig. 3.—An average-sized acerate spiculum, from the skeleton. × 80 linear.

Fig. 4.—An average-sized acuate, skeleton spiculum. × 80 linear.

Plate XLIII.



Halichondria corrugata 1–6.
H. forcipis 7–13. H. subdola 14–16.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE XLIII.

Halichondria corrugata, *Bowerbank.*

Vol. ii, p. 242, 'Mon. Brit. Spongiadæ.'

Figs. 1, 2.—Represent the two living specimens I obtained from the Diamond Ground, off Hastings. The figures are from the specimens in the dried state; fig. 1, the sponge enveloping a branching zoophyte; fig. 2, the specimen nearly covering the fan-shaped Desmacidon ægagropila, the fibrous skeleton structure of which is distinctly represented at the base of the figure. Natural size.

Fig. 3.—Represents a portion of the strongly reticulated dermal membrane of the sponge, with the open inhalent pores in its areas. × 36 linear.

Fig. 4.—A skeleton spiculum. × 150 linear.

Fig. 5.—A spiculum from the interstitial membranes in an immature state of development. × 150 linear.

Fig. 6. — One of the contort, bihamate, retentive spicula, from the interstitial membranes. × 250 linear.

Halichondria forcipis, *Bowerbank.*

Vol. ii, p. 244, 'Mon. Brit. Spongiadæ.'

Fig. 7. — Represents one of the three specimens dredged at Shetland in 1864. Natural size.

Fig. 8.—One of the skeleton spicula. × 250 linear.

Fig. 9. — A subclavated, cylindrical, tension spiculum, from the dermal membrane. × 250 linear.

Fig. 10.—One of the large, bidentate, equi-anchorate,

retentive spicula, of the dermal membrane. × 530 linear.

Fig. 11. — A tridentate, equi-anchorate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 12.—A simple, bihamate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 13.—One of the forcipiform tension spicula, from the interstitial membranes. × 250 linear.

Halichondria subdola, *Bowerbank*.

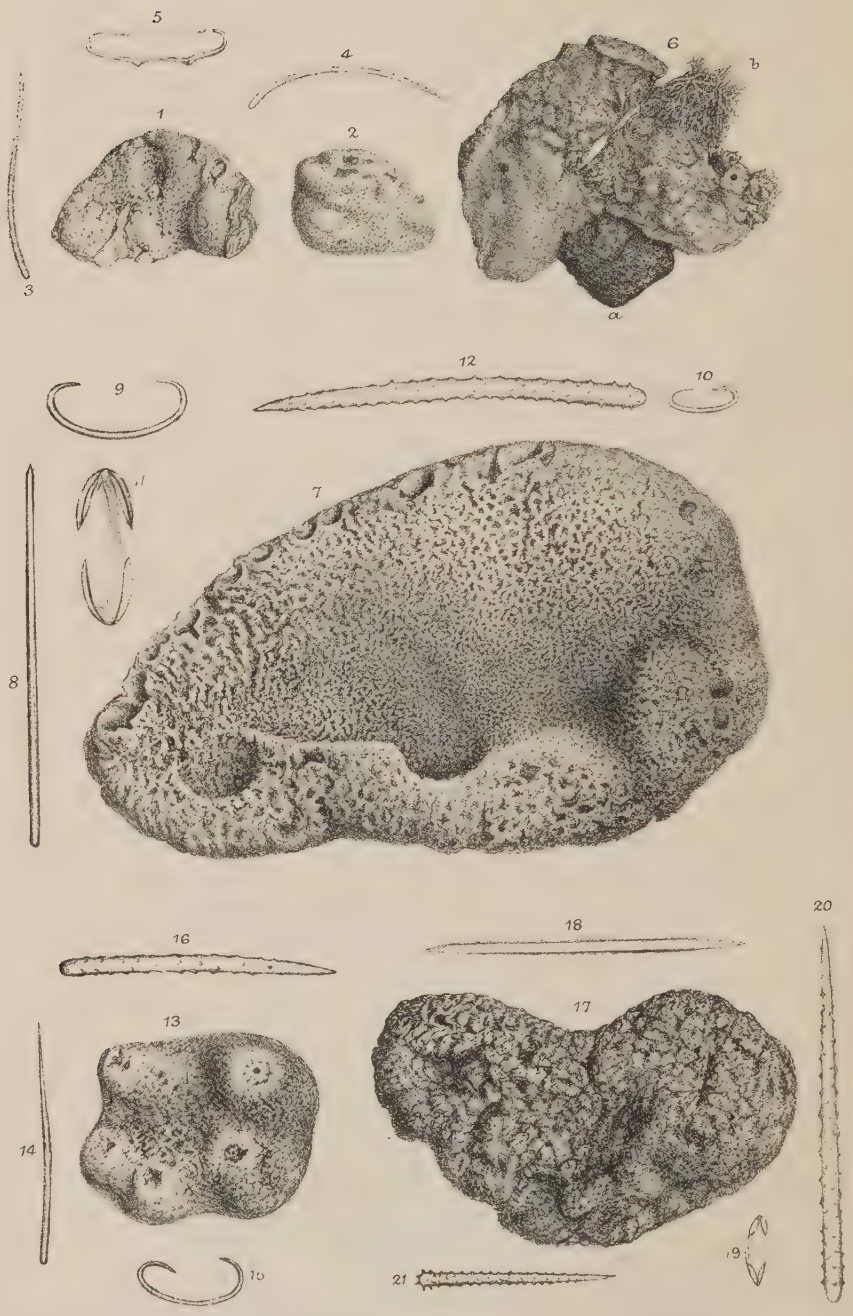
Vol. ii, p. 247, 'Mon. Brit. Spongiadæ.'

Fig. 14.—Represents the type-specimen from Vazon Bay, Guernsey, of the natural size, and in the dried state. In the cabinet of the Rev. A. M. Norman.

Fig. 15.—One of the slender acuate spicula, from the dermal membrane. × 150 linear.

Fig. 16.—A skeleton spiculum. × 150 linear.

Plate XLIV.



Halichondria Thompsoni 1-5. Isodictya simplex 6. & Pl. L. fig. 18.
Halichondria incrustans 7-12. H. candida 13-16. H. irregularis 17-21.

W. Lens Aldous del. et lith

W. West & Co imp.

PLATE XLIV.

Halichondria Thompsoni, *Bowerbank.*

Vol. ii, p. 243, 'Mon. Brit. Spongiadæ.'

Figs. 1 and 2. — Represent the largest two of three specimens obtained by the Rev. A. M. Norman, at Jersey, 1867. The specimens were preserved in spirit; but they are figured in the dried state, of the natural size. The original of No. 1 is in the cabinet of Mr. Norman; that of No. 2 he kindly presented to me. The third specimen in the possession of Mr. Norman is less in size than the one represented by No. 2.

I applied through my friend Mr. Robert Patterson to the Museum of Belfast for the loan of the type-specimen, that it might be figured, but I regret to say that it could not be found.

Fig. 3. — One of the skeleton spicula. × 150 linear.

Fig. 4. — A tension spiculum, from the interstitial membranes. × 150 linear.

Fig. 5. — One of the bidentate, equi-anchorate, retentive spicula, from the dermal membrane. × 530 linear.

Isodictya simplex, *Bowerbank.*

Vol. ii, p. 294, 'Mon. Brit. Spongiadæ.'

Fig. 6.—Represents the largest specimens of the species that I have seen in the condition in which it came from the sea, having been preserved in spirit by the Rev. A. M. Norman, who dredged it in Strangford Lough, Ireland, October 8th, 1869. It is attached to a small pebble (*a*), and some minute fuci are partly enveloped in its substance at (*b*). Natural size. Specimen in the cabinet of the Rev. A. M. Norman.

Many other specimens of this species of less size were obtained from Strangford Lough when the one represented by figure 6 was taken by Mr. Norman.

For the figure of the spiculum of this species I must refer the reader to Plate L, fig. 18, of the present volume.

The figure of Isodictya simplex was drawn on the stone and printed through an error of mine, instead of that of Halichondria simplex, and the mistake was not discovered until it was too late to remedy it otherwise than has been done above.

Halichondria incrustans, *Johnston*.

Vol. ii, p. 249, 'Mon. Brit. Spongiadæ.'

Fig. 7.—Represents a fine specimen of the species dredged on the Diamond Trawling Ground, off Hastings. Natural size.

Fig. 8.—One of the cylindrical mucronate spicula of the dermal fasciculi. × 250 linear.

There is a considerable variation in the amount of the development of the mucronate character in these spicula; in some it is scarcely apparent, while in others it is very distinctly produced.

Fig. 9.—A large, contort, bihamate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 10.—One of the small, simple, bihamate, retentive spicula from the dermal membrane. × 530 linear.

The small, simple, bihamate spiculum is not an undeveloped one of the larger description, but a form separate and distinct from it; and it appears to be quite as numerous as the larger ones.

Fig. 11.—A bidentate, equi-anchorate spiculum, from the dermal membrane. × 530 linear.

Fig. 12.—An average-sized skeleton spiculum of the normal acuate form. × 250 linear.

I have never succeeded in finding this sponge on the

rocks between high and low water mark, in the neighbourhood of Hastings, although it is by no means uncommon in such localities at Tenby. It is of very common occurrence among the sponges brought in from the Diamond Ground, by the Hastings trawlers, and some of the specimens exceed the figured one in size.

From a more extensive acquaintance with this species it appears almost to rival Halichondria panicea in the variety of forms it assumes. I have it parasitical on small branching fuci, embracing the stem, and forming with them an irregular mass, thinly coating the valves of Pecten opercularis, in small thick masses on the Tenby Rocks between tide marks, and in irregularly-shaped masses, without any indications of an attachment, having apparently been floating freely about in the sea.

Halichondria candida, *Bowerbank.*

Vol. ii, p. 251, 'Mon. Brit. Spongiadæ.'

Fig. 13.—Represents the finest and best developed specimen of the species. In the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 14.—One of the dermal spicula. × 250 linear.

Fig. 15.—A contort, bihamate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 16.—One of the skeleton spicula. × 250 linear.

Halichondria irregularis, *Bowerbank.*

Vol. ii, p. 251, 'Mon. Brit. Spongiadæ.'

Fig. 17.—Represents the type-specimen in the dried state, and of the natural size.

Fig. 18.—One of the sub-fusiformi acerate spicula, from the dermal membrane. × 250 linear.

Fig. 19.—A bidentate equiangulated retentive spiculum from the dermal membrane. × 530 linear.

Fig. 20.—One of the attenuato-acuate, basally and medially-spined, skeleton spicula. × 250 linear.

Fig. 21.—An attenuato-acuate, entirely-spined, internal, defensive spiculum. × 250 linear.

Halichondria Dickiei 1–6. H. granulata 7–13. H. scandens 14–20.
H. albula 21–24. H. nigricans 25–31. Hymeniacidon variantia 32–34.
(& Pl. XXXIII. fig. 14.)

W. Lees Aldous del. et lith. W. West & Co. imp.

PLATE XLV.

Halichondria Dickiei, *Bowerbank.*

Vol. ii, p. 253, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen received from Dr. Dickie. Natural size.

Fig. 2.—A mucronato-cylindrical spiculum, from the dermal membrane. × 250 linear.

Fig. 3.—One of the subclavate, hastate spicula, from the dermal membrane. × 250 linear.

Fig. 4.—An acuate, entirely-spined spiculum, from the skeleton. ×250 linear.

Fig. 5.—One of the large, bidentate, equi-anchorate, retentive spicula. × 530 linear.

Fig. 6.—A large, tridentate, equi-anchorate spiculum, from the inner surface of the dermal membrane. × 530 linear.

Halichondria granulata, *Bowerbank.*

Vol. ii, p. 262, 'Mon. Brit. Spongiadæ.'

Fig. 7.—Represents the type-specimen received from the late Mr. Joshua Alder. Natural size.

Fig. 8.—One of the submucronate cylindrical spicula, from the dermal membrane. × 250 linear.

Fig. 9.—A large, bidentate, equi-anchorate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 10.—A small, tridentate, equi-anchorate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 11.—One of the acuate, entirely and incipiently-spined skeleton spicula. × 250 linear.

Figs. 12 and 13.—Two of the attenuato-acuate, entirely-spined, internal, defensive spicula. × 250 inear. These spicula differ greatly in size. The two

figured are neither the largest nor smallest of their kind, but those sizes, and the intervening ones, which appear to be the most numerous in the sponge.

Halichondria scandens, *Bowerbank.*

Vol. ii, p. 259, 'Mon. Brit. Spongiadæ.'

Fig. 14. — Represents the type-specimen of the species, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 15.—One of the large, fusiformi-cylindrical, tension spicula, from the dermal membrane. × 250 linear.

Fig. 16.—A simple, bipocillated, anchorate spiculum, from the dermal membrane. × 530 linear.

Fig. 17.—One of the dentato-palmate, inequi-anchorate, retentive spicula, from the dermal membrane. × 530 linear.

Fig. 18.—A bidentate, inequi-anchorate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 19.—A skeleton spiculum, basally and apically spined. × 250 linear.

Fig. 20.—One of the short, stout, entirely-spined, internal, defensive spicula. × 250 linear.

Halichondria albula, *Bowerbank.*

Vol. ii, p. 268, 'Mon. Brit. Spongiadæ.'

Fig. 21.—Represents the type-specimen which I received from my late friend, Mr. Barlee. Natural size. The sponge occupies the light portion of the shell at *a*.

Fig. 22.—One of the large, acuate, entirely and profusely spined spicula, from the dermal membrane. × 530 linear.

Fig. 23.—A skeleton spiculum. × 530 linear. Many of these spicula are more or less flexuous.

Fig 24. — One of the bidentate, equi-anchorate, retentive spicula. × 530 linear.

Halichondria nigricans, *Bowerbank.*

Vol. ii, p. 266, 'Mon. Brit. Spongiadæ.'

Fig. 25.—Represents the type-specimen received from Mr. McAndrew. Natural size.

Fig. 26.—One of the terminally spined, subfusiform, cylindrical spicula, from the dermal membrane. × 250 linear.

Fig. 27.—A palmato-inequi-anchorate spiculum, from the dermal membrane. × 530 linear.

Fig. 28.—A dentato-inequi-anchorate spiculum, from the dermal membrane. × 530 linear.

Figs. 29 and 30.—Two of the inequi-bipocillated spicula, from the interstitial membranes. × 530 linear.

Fig. 31.—An acuate, entirely but minutely spined, skeleton spiculum. × 250 linear.

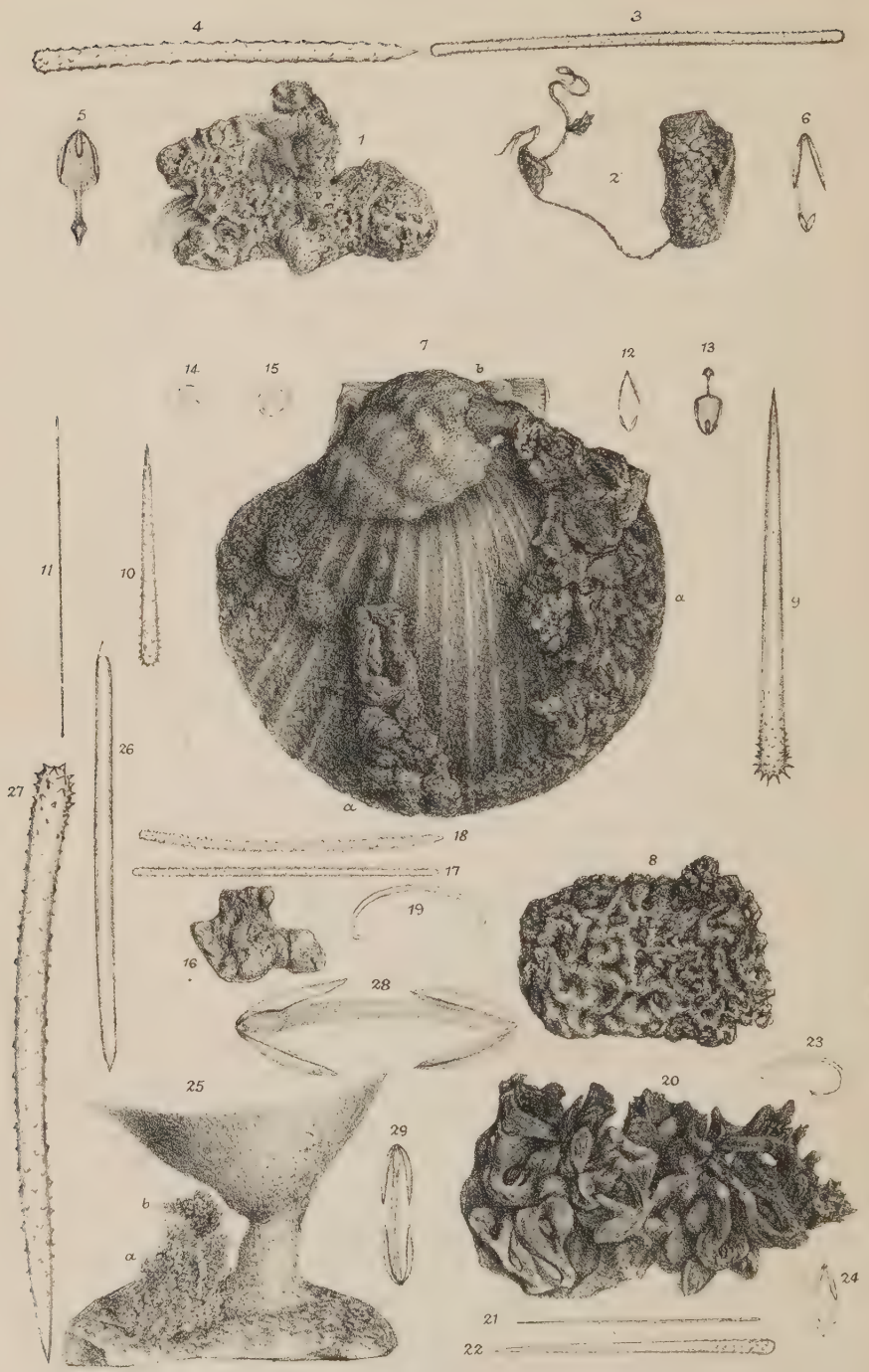
Hymeniacidon variantia, *Bowerbank.*

Vol. ii, p. 174, 'Mon. Brit. Spongiadæ.'

Fig. 32.—A skeleton spiculum of Hymeniacidon variantia, of the normal form and of the largest size. × 123 linear.

Fig. 33.—A smaller sized skeleton spiculum of the same species, exhibiting one of the common forms of contortion, which prevails among the smaller sized skeleton spicula. × 123 linear.

Fig. 34.— Represents a small portion of the dermal membrane, with its spicula *in sitû*, with loosely fasciculated, minute, acuate, tension spicula, and the large and small bihamate retentive spicula irregularly dispersed. × 320 linear.



Halichondria Pattersoni 1–6. H. Hyndmani 7–15. H. pulchella 16–19.
H. Ingalli 20–24. H. Batei 25–29.

W. Lens Aldous del. et lith.

W. West & Co imp.

PLATE XLVI.

Halichondria Pattersoni, *Bowerbank*.

Vol. ii, p. 255, 'Mon. Brit. Spongiadæ.'

Fig. 1.—The largest specimen of the species that I have seen. It is in the cabinet of the Rev. A. M. Norman; it was labelled from the Minch, 1866. Natural size.

Fig. 2.—Represents three small specimens of H. Pattersoni parasitical on a small stem of a zoophyte, for which I am indebted to the Rev. A. M. Norman, who obtained it at the Minch in 1866. Natural size.

Fig. 3. — One of the incipiently spined, tension spicula, from the dermal membrane. × 250 linear.

Fig. 4.—An acuate, entirely spined, skeleton spiculum. × 250 linear.

Fig. 5.—A dentato-palmate, inequi-anchorate, retentive spiculum. × 530 linear.

Fig. 6.—A bidentate inequi-anchorate spiculum, from the interstitial membranes of the sponge, represented by fig. 1. I did not obtain any of this form in the type-specimen. It was not in nearly so fine a state of preservation as the specimens obtained by Mr. Norman at the Minch. × 530 linear.

Halichondria Hyndmani, *Bowerbank*.

Vol. ii, p. 264, 'Mon. Brit. Spongiadæ.'

Fig. 7.—Represents a fine specimen of the species on a shell of Pecten opercularis, from the Diamond Ground, off Hastings, (*a a*) the sponge, (*b*) a patch of Cellepora pumicosa. Natural size.

Fig. 8.—Represents a fine detached mass of H. Hyndmani from the Diamond Ground. It is in a fine state of preservation, and exhibits the surface charac-

ters of the sponge in a very satisfactory manner. Natural size.

Fig. 9.—One of the semi-spinous, attenuato-acuate, skeleton spicula. × 250 linear.

Fig. 10.—An attenuato-acuate, entirely-spined, internal, defensive spiculum. × 250 linear.

Fig. 11.—One of the slender, cylindrical, tension spicula. × 250 linear.

Fig. 12.—A bidentate, inequi-anchorate, retentive spiculum, from the dermal membrane. × 530 linear.

Fig. 13.—A dentato-palmate, inequi-anchorate, retentive spiculum, from the interstitial membranes. × 530 linear. This form of spiculum was not observed in the specimen of the sponge first examined. In the specimen figured they are about equal in number to the bidentate spicula.

Figs. 14, 15. — Bipocillated anchorate, retentive spicula, from the interstitial membranes. × 530 linear. These singular forms of spicula are represented on a larger scale from the same species of sponge in plate v, figs. 123—127, vol. i, 'Mon. Brit. Spongiadæ.'

Since the first publication of H. Hyndmani I have received numerous specimens on the shells of Pecten opercularis, but it is only on comparatively a few of them that the sponge is developed in the massive state represented at *a a*, fig. 7. On by far the greater number of the shells it forms only a thin crust, as represented covering the remaining portions of the shell.

Halichondria pulchella, *Bowerbank*.

Vol. ii, p. 256, 'Mon. Brit. Spongiadæ.'

Fig. 16. — Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 17.—One of the subfusiformi, cylindrical, ter-

minally incipiently spinous spicula, of the dermal membrane. × 250 linear.

Fig. 18.—One of the subfusiformi-acuate skeleton spicula. × 250 linear.

Fig. 19.—A simple, bihamate, retentive spiculum, from the interstitial membranes. × 530 linear.

Halichondria Ingalli, *Bowerbank.*

Vol. ii, p. 258, 'Mon. Brit. Spongiadæ.'

Fig. 20.—Represents the type-specimen in the dried state. Natural size.

Fig. 21.—A slender, subfusiform, cylindrical spiculum, from the dermal membrane. × 250 linear.

Fig. 22.—One of the attenuato-acuate, basally-spined, skeleton spicula. × 250 linear.

Fig. 23.—One of the malformed, bihamate, retentive spicula, from the dermal membrane. × 530 linear.

Fig. 24.—An angulated, inequi-anchorate, retentive spiculum, from the dermal membrane. × 530 linear.

Halichondria Batei, *Bowerbank.*

Vol. ii, p. 261, 'Mon. Brit. Spongiadæ.'

Fig. 25.—Represents the type-specimen as described in p. 261, vol. ii. Of the natural size; (*a*) is the sponge H. Batei, and (*b*) a portion of a young specimen of Dictyocylindrus rugosus rising above it. The whole of the cup of Isodictya infundibuliformis has not been figured, as it would have occupied too great an amount of space in the Plate.

Fig. 26.—One of the obtusely pointed, acuate, tension spicula, of the dermal membrane. × 250 linear.

Fig. 27.—One of the stout, acuate, entirely spined, skeleton spicula. × 250 linear.

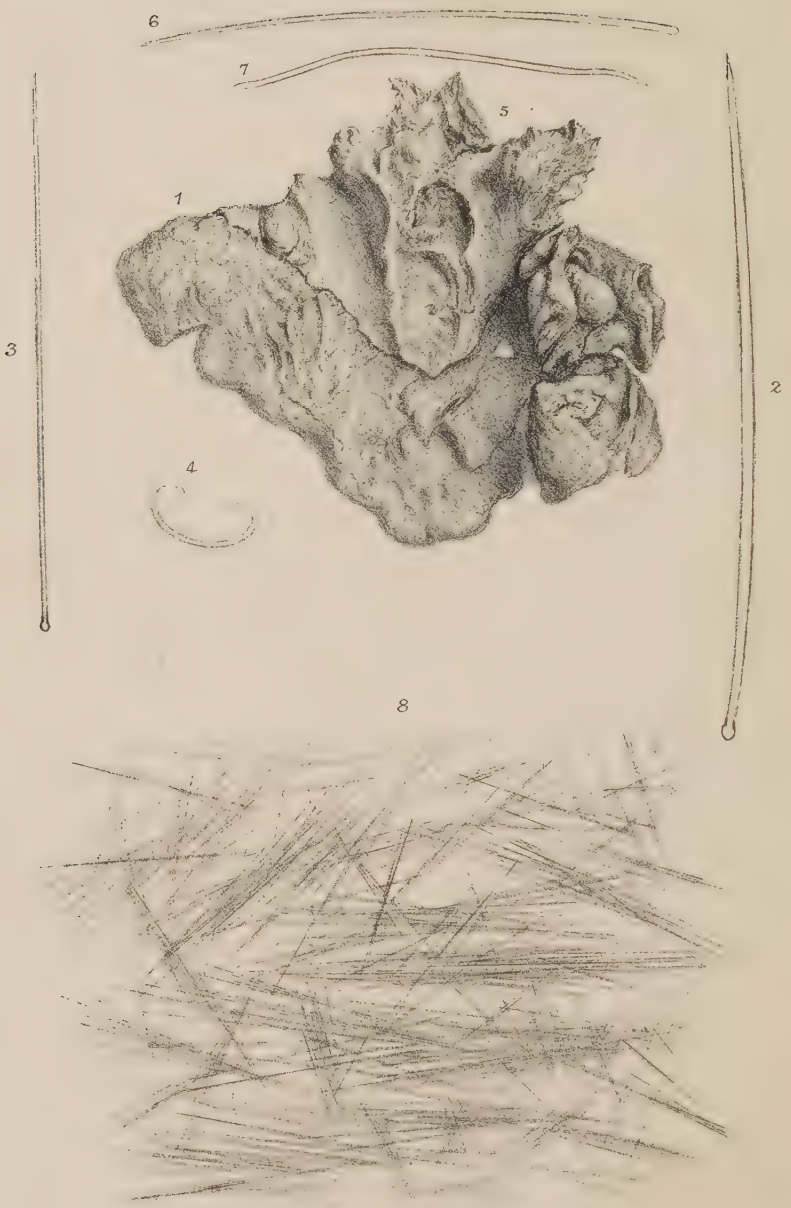
Fig. 28.—A large, bidentate, equi-anchorate, reten-

tive spiculum, from the interstitial membranes. × 530 linear.

Fig. 29.—One of the small series of bidentate, equianchorate, retentive spicula, of the interstitial membranes. × 530 linear.

The great comparative size of the spicula of this little sponge is very characteristic of the species.

Plate XLVII.



Halichondria inornatus 1–4.
H. simplex 5–7. Raphiodesma lingua 8.

W. Lens Aldous del. et lith. W. West & Co imp.

PLATE XLVII.

Halichondria inornatus, *Bowerbank.*

Vol. ii, p. 271, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen sent to me by Mr. Peach, with the type-specimen of Halichondria simplex, fig. 5, closely incorporated with it, on the upper part of the specimen. Natural size.

Fig. 2.—An average-sized, skeleton spiculum. × 150 linear.

Fig. 3.—A young spiculum, from the interstitial membranes of the sponge. × 150 linear.

Fig. 4.—A simple, bihamate, retentive spiculum, from the dermal membrane. × 530 linear.

Halichondria simplex, *Bowerbank.*

Vol. ii, p. 246, 'Mon. Brit. Spongiadæ.'

Fig. 5.—Represents the type-specimen of the species, incorporated with the mass of Halichondria inornatus, fig. 1, sent to me by Mr. Peach. Natural size.

Fig. 6.—A skeleton spiculum, of the normal form. × 80 linear

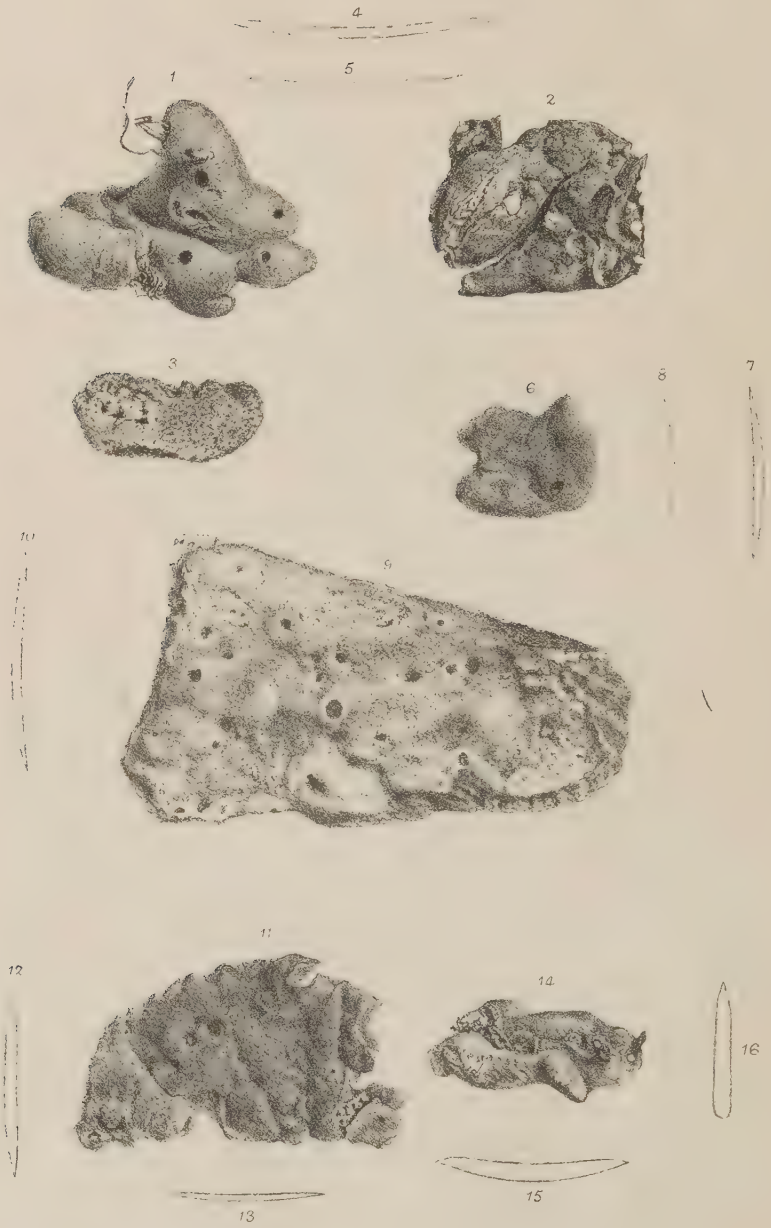
Fig. 7.—One of the flexuous skeleton spicula. × 80 linear.

Raphiodesma lingua, *Bowerbank.*

Hymeniacidon lingua, Bow. 'Mon. Brit. Spongiadæ,' vol. ii, p. 187.

A portion of the skeleton of the specimen represented by fig. 1, Plate LXXV, illustrating the faggot-like fasciculation of the skeleton structure, on which the genus is founded. × 60 linear.

Plate XLVIII.



Isodictya cinerea 1–5. I. Peachii 6–8.
I. permollis 9–10. I. simulo 11–13. I. varians 14–16.

W. Lens Aldous del. et lith. W. West & Co imp.

PLATE XLVIII.

ISODICTYA CINEREA, *Bowerbank*.

Vol. ii, p. 274, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a specimen of the species in a fine state of preservation from Fowey, Cornwall, by Mr. C. W. Peach. Natural size.

Fig. 2.—One of the type-specimens of the species in the Johnstonian collection in the British Museum marked 17[c]. Natural size.

Fig. 3.—Another specimen of the species in the Johnstonian collection in the British Museum marked 17[d]. Natural size.

Fig. 4.—A skeleton spiculum, from the specimen represented by fig. 2. × 250 linear.

Fig. 5.—One of the tension spicula, from the interstitial membranes of the specimen represented by fig. 2. × 250 linear.

I regret that I have been unable to figure the type-specimen of this sponge. I applied to my friend Professor Grant for the loan of it for that purpose, but unfortunately, although diligently searched for, it could not be found. When I wrote the description of this sponge, in vol. ii, p. 275, of the 'Mon. Brit. Spongiadæ,' I believed it to be a rare species, but since that time I have obtained numerous specimens from various localities exhibiting considerable variations in form. Very few of them exceeded the figured specimen, Plate XXXVII, fig. 1, in size; but since then I have examined a specimen I obtained from the Diamond Ground off Hastings that greatly exceeds any of those previously acquired in its dimensions, and which, unlike any of them, appears to have risen from a sessile base and to have assumed a rudely compressed fan-like form, two and three quarters inches high and

the same at its greatest breadth, a little above half its height. The distal end is one and a quarter inch thick, and has three short mammiform cloacæ projecting from it, about five lines high and of about the same diameter, their terminal orifices varying from one and a half to two lines in diameter. The proximal or basal end is one and a half inch in breadth and five lines in thickness; it has not the natural basal surface, but it appears to have been torn off immediately above it. The colour and surface characters of the sponge are in perfect accordance with the other well-known specimens, but the size and mode of its development is different from any of those previously acquired. The specimen represented by fig. 1 is very characteristic of the general aspect of the sponge; it was obtained at Fowey, Cornwall, and was presented to me by my indefatigable friend Mr. C. W. Peach. This specimen is parasitical on a small tubular zoophyte, and following its course it has assumed a lobular form; bus this is not the case in many other specimens. In a fine one in the cabinet of the Rev. A. M. Norman the sponge has apparently been based on a flat surface, and is spread out evenly for two inches in length by one inch in breadth, and of the uniform thickness of about one eighth of an inch; in this space there are three simple oscula at about equal distances from each other, and each about a line in diameter. The same flat thinly-spreading character is apparent in other specimens which I possess or have seen, and when in good condition the same nut-brown colour prevails in all of them in the dried state. In addition to the habitats previously given I may state Fowey, Cornwall, by Mr. Peach; Bantry Bay and Tobermory, Rev. A. M. Norman, and I have received several specimens from the Diamond Ground, off Hastings; besides the large one described above I have two specimens from the Diamond Ground, which are based on the carapaces of two Pisa Gibbsii, and also a specimen from Shetland on the root of a fucus. This species, therefore,

appears to be very widely distributed, and to be by no means so rare as it was at first imagined to be.

Isodictya Peachii, *Bowerbank.*

Vol. ii, p. 276, 'Mon. Brit. Spongiadæ.'

Fig. 6.—Represents a specimen of the species from Guernsey in a fine state of preservation. In the cabinet of the Rev. A. M. Norman Natural size.

Fig. 7.—One of the skeleton spicula. × 250 linear.

Fig. 8.—One of the tension spicula, from the interstitial membranes. × 250 linear.

Isodictya permollis, *Bowerbank.*

Vol. ii, p. 278, 'Mon. Brit. Spongiadæ.'

Fig. 9.—Represents a specimen of the species from Scarborough sent to me by Mr. Bean. Natural size.

Fig. 10.—A skeleton spiculum. × 250 linear.

The Rev. A. M. Norman obtained a specimen of this species from Strangford Lough, October 5th, 1869. It was of a light brown colour. The anatomical structure was identical with that of the type-specimen, and the dermal membrane was in a fine state of preservation. A small piece mounted in water exhibited the pores in an open condition, from one to three occupying the areas of the network produced by the terminations of the distal ends of the skeleton tissue immediately beneath the dermal membrane.

Isodictya simulo, *Bowerbank.*

Vol. ii, p. 279, 'Mon. Brit. Spongiadæ.'

Fig. 11.—Represents the type-specimen of the species in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 12.—A skeleton spiculum. × 250 linear.
Fig. 13.—One of the dermal tension spicula. × 250 linear.

Isodictya varians, *Bowerbank.*

Vol. ii, p. 281, ' Mon. Brit. Spongiadæ.'

Fig 14. — Represents the type-specimen of the species in the Johnstonian collection in the British Museum, marked 17ᵉ, and labelled Halichondria cinerea. Natural size.
Fig. 15.—A skeleton spiculum. × 250 linear.
Fig. 16.—One of the short, stout, acuate spicula. × 250 linear.

Plate XLIX.

Isodictya elegans 1-5. I. parasitica 6-8. I. Mc. Andrewii 9-11.
I. rosea 12-14. I. indefinita 15-17.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE XLIX.

Isodictya elegans, *Bowerbank.*

Vol. ii, p. 283, 'Mon. Brit. Spongiadæ.'

Figs. 1, 2, 3.—Represent three portions of the type-specimen of the species in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 4.—A skeleton spiculum. × 250 linear.

Fig. 5.—One of the tension spicula, from the interstitial membranes. × 250 linear.

Isodictya parasitica, *Bowerbank.*

Vol. ii, p. 287, 'Mon. Brit. Spongiadæ.'

Fig. 6.—Represents the specimen in the Johnstonian collection in the British Museum, designated Halichondria fucorum, and marked 51, 7, 25—225, from Dundee, by Mr. Gardner. The portions of sponge opposite *a a a a* are I. parasitica; those opposite *b b* I. Clarkei. For a description of the latter species I must refer the reader to page 330 of vol. ii, 'Mon. Brit. Spongiadæ.'

Fig. 7.—One of the subfusiformi skeleton spicula. × 250 linear.

Fig. 8.—A tension spiculum. × 250 linear.

Isodictya McAndrewii, *Bowerbank.*

Vol. ii, p. 284, 'Mon. Brit. Spongiadæ.'

Fig. 9.—Represents the type-specimen presented to me by Mr. McAndrew. Natural size.

Fig. 10.—One of the stout, short, skeleton spicula. × 250 linear.

Fig. 11.—A tension spiculum, from the interstitial membranes. × 250 linear.

Isodictya rosea, *Bowerbank.*

Vol. ii, p. 282, 'Mon. Brit. Spongiadæ.'

Fig. 12.—Represents a characteristic specimen of the species based on a fragment of the Rock from one of the small caves of St. Catherine's Rock, Tenby. Natural size. The mass of sponge occupies nearly the middle of the fragment of stone.

Fig. 13.—A skeleton spiculum. × 250 linear.

Fig. 14.—One of the tension spicula, from the interstitial membranes. × 250 linear.

Isodictya indefinita, *Bowerbank.*

Vol. ii, p. 286, 'Mon. Brit. Spongiadæ.'

Fig. 15.—Represents the type-specimen sent to me by Mrs. Griffiths. Natural size.

Fig. 16.—One of the spicula of the skeleton. × 250 linear.

Fig. 17.—A tension spiculum, from the interstitial membranes. × 250 linear.

Plate L.

Isodictya anomala 1–4. I. densa 5–7. I. pallida 8–10.
I. jugosa 11–14. I. Gregorii 15–17. I. simplex 18.

W. Lens Aldous del. et lith. W. West & Co. imp.

PLATE L.

Isodictya anomala, *Bowerbank*.

Vol. ii, p. 293, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen of the species from Torbay, by Mrs. Griffiths. Natural size.

Fig. 2.—One of the large, stout, acerate, skeleton spicula of the primary lines of the skeleton. × 250 linear.

Fig. 3.—An inflato-fusiformi, acerate spiculum, from the secondary lines of the skeleton. × 250 linear.

Fig. 4.—A slender, acerate, tension spiculum, from the interstitial membranes. × 250 linear.

Isodictya densa, *Bowerbank*.

Vol. ii, p. 292, 'Mon. Brit. Spongiadæ.'

Fig. 5.—Represents the type-specimen of the species in the cabinet of the Rev. A. M. Norman. Natural size.

Figs. 6 and 7.—Two spicula from the skeleton of the sponge. × 250 linear.

There is a small specimen of Microciona plumosa, adhering to the specimen at (*a*), figure 5.

Isodictya pallida, *Bowerbank*.

Vol. ii, p. 297, 'Mon. Brit. Spongiadæ.'

Fig. 8.—Represents a large and very fine specimen of the species, from the Diamond Ground, off Hastings. Natural size.

Fig. 9.—One of the skeleton spicula. × 250 linear.

Fig. 10.—A slender, fusiformi-acerate, tension

spiculum, from the interstitial membranes. × 250 linear.

Isodictya jugosa, *Bowerbank*.

Vol. ii, p. 296, 'Mon. Brit. Spongiadæ.'

Fig. 11.—Represents the type-specimen of the species from Shetland, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 12.—A skeleton spiculum. × 250 linear.

Fig. 13.—One of the tension spicula, from the interstitial membrane. × 250 linear.

Fig. 14.—A simple bihamate spiculum, from the dermal membrane. × 530 linear.

Isodictya Gregorii, *Bowerbank*.

Vol. ii, p. 301, 'Mon. Brit. Spongiadæ.'

Fig. 15.—Represents the type-specimen of the species from the Moray Frith. Natural size. The sponge coats the inner surface of the shell for nearly half the inner portion towards the hinge of the shell.

Fig. 16.—A skeleton spiculum of about the average size. × 250 linear.

Fig. 17.—One of the tension spicula of the interstitial membranes. × 250 linear.

Isodictya simplex, *Bowerbank*.

Vol. ii, p. 294, 'Mon. Brit. Spongiadæ.'

For the figure of this species I must refer the reader to Plate XLIV, fig. 6, of the present volume.

Fig. 18.—Represents one of the skeleton spicula. × 250 linear.

In January, 1870, I received five specimens of sponges for examination from the Rev. A. M. Norman, who found them at low water mark in Strangford

Lough, in 1869. They were preserved in spirit in the state in which they came from the sea. All of them were parasitical on small fuci. The largest of them did not exceed two inches in length, and the colour of all of them was that of a dirty light green, with a tint of light brown. In their wet condition they were soft to the touch, and by no means attractive to the eye. Two of them proved to be Isodictya simplex. On mounting portions of the specimens in Canada balsam their structural characters, as described in vol. ii, page 295, 'Mon. Brit. Spongiadæ,' were in perfect accordance with those of the type-specimen.

Plate LI.

Isodictya indistincta 1–4. I. simulans 5–6.
I. mammeata 7–9. I. fallax 10–13.

W. Lens Aldous del et lith. W. West & Co imp.

PLATE LI.

Isodictya indistincta, *Bowerbank.*

Vol. ii, p. 290, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a large specimen from the Diamond Ground, off Hastings. Natural size. It is remarkable for the large size of the oscular orifices.

Fig. 2.—Represents a specimen dredged off Guernsey by Mr. W. Saville Kent in 1870. Natural size.

Fig. 3.—A skeleton spiculum. × 250 linear.

Fig. 4.—One of the tension spicula, from the interstitial membranes. × 250 linear.

I received five specimens in a bottle with spirit from the Rev. Mr. Norman labelled, "Strangford Lough, October 8th, 1869." Among them I found a specimen of I. indistincta, of an irregular massive form, nearly one inch in length and about eight or nine lines in diameter. It was solid in substance, but very soft and compressible, and of a dark olive-green colour. A few small branches of a slender fucus were projected from its surface, and it is probable that it was parasitical on the plant in the living state. It agreed precisely in its anatomical characters with the type-specimen.

The specimen represented by fig. 2 is remarkable from its great similitude in form to Ophlitaspongia papilla. It affords an admirable illustration of the little dependence to be placed on form, size, and colour, in discriminating the species of sponges.

Mr. Peach has also found this species in Fowey Harbour in 1847.

Isodictya simulans, *Bowerbank.*

Vol. ii, p. 308, 'Mon. Brit. Spongiadæ.'

Fig. 5.—A finely-developed specimen of the species, from off Hastings. Natural size.

Fig. 6. — One of the skeleton spicula. × 250 linear.

A small piece of the dermal membrane of this species is figured in Plate LXXVI, fig. 5. × 123 linear, in contrast with the dermal membrane of I. Ingalli.

Isodictya mammeata, *Bowerbank.*

Vol. ii, p. 306, 'Mon. Brit. Spongiadæ.'

Fig. 7.—Represents a specimen of the species from the Diamond Ground, off Hastings. Natural size.

Fig. 8.— One of the skeleton spicula. × 250 linear.

Fig. 9.—A tension spiculum, from the interstitial membranes. × 250 linear.

Isodictya fallax, *Bowerbank.*

Vol. ii, p. 302, 'Mon. Brit. Spongiadæ.'

Fig. 10. — Represents the type-specimen of the species in the cabinet of the Rev. A. M. Norman.

Fig. 11.—A skeleton spiculum. × 250 linear.

Fig. 12. — One of the tension spicula, from the dermal membrane. × 250 linear.

Fig. 13.— A tricurvate, acerate, tension spiculum, from the dermal membrane. × 530 linear.

Plate LII.

Isodictya palmata.

W.L. Aldous del et lith. ad nat

W. West & Co imp

PLATE LII.

Isodictya palmata, *Bowerbank.*

Vol. ii, p. 311, 'Mon. Brit. Spongiadæ.'

Fig. 1.— Represents the specimen of this species designated as the "Mermaid's Glove" sponge, dredged at the Orkney Islands, by Mr. McAndrew, in 1851. Half the natural size.

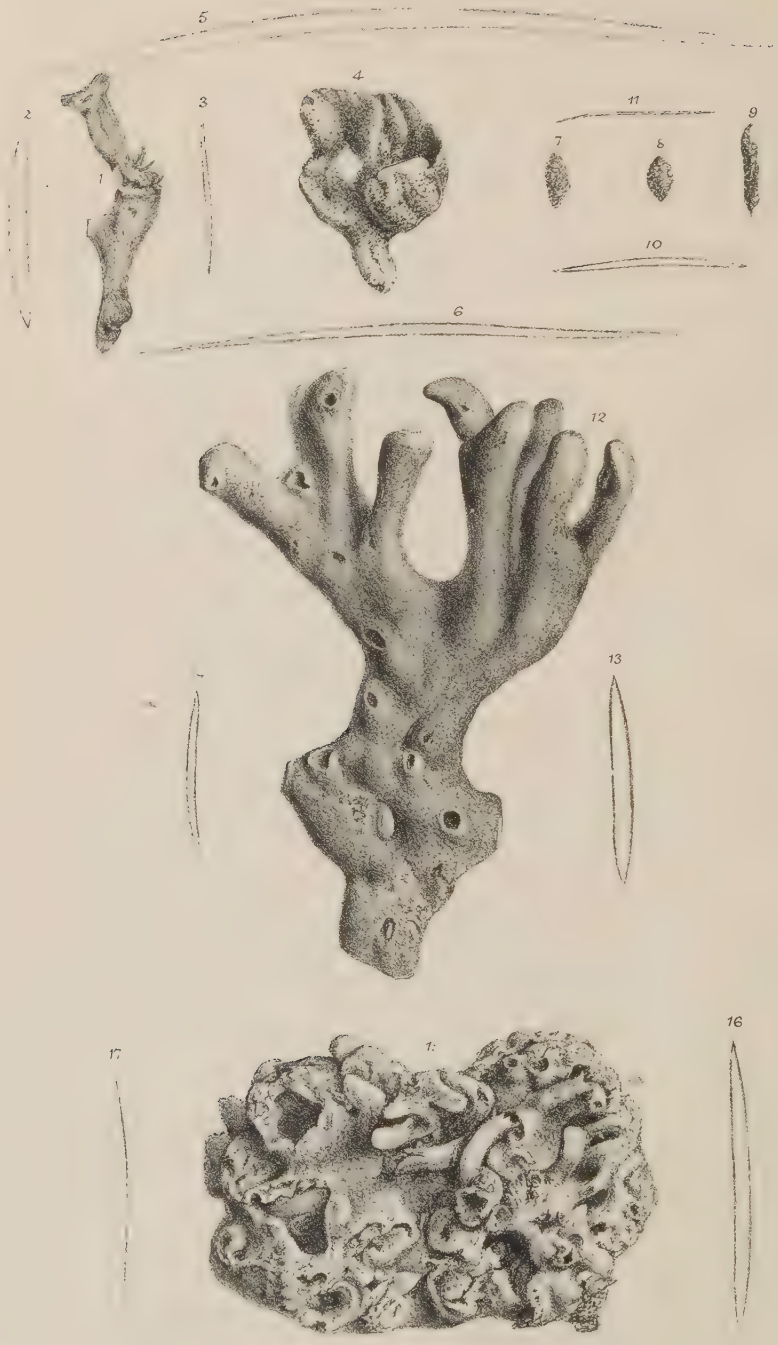
Fig. 2.—A small portion of the reticulated skeleton of the sponge, illustrating its structural peculiarities. × 80 linear.

Figs. 3, 4, 5.—Three of the remarkable equi-anchorate, retentive spicula, with flexuous terminations. × 666 linear.

Fig. 6.—One of the minute equi-anchorate retentive spicula, with siliceo-membranous terminations. × 666 linear.

Fig. 7.—One of the skeleton spicula.

Plate LIII.



Isodictya ramusculus 1–3. I. pocillum 4–6.
I. clava 7–11. I. dichotoma 12–14. I. fistulosa 15–17.

W. Lens Aldous del. et lith.

W. West & Co imp.

PLATE LIII.

Isodictya ramusculus, *Bowerbank.*

Vol. ii, p. 314, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen presented to me by Mr. Gosse. Natural size.

Fig. 2. — One of the skeleton spicula. × 250 linear.

Fig. 3.—A tension spiculum, from the interstitial membranes. × 250 linear.

Isodictya pocillum, *Bowerbank.*

Vol. ii, p. 305, 'Mon. Brit. Spongiadæ.'

Fig. 4.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 5. — One of the skeleton spicula. × 250 linear.

Fig. 6.—One of the slender, attenuato-acerate, interstitial spicula. × 250 linear.

Isodictya clava, *Bowerbank.*

Vol. ii, p. 316, 'Mon. Brit. Spongiadæ.'

Figs. 7, 8, 9.—Three specimens of the species from the Moray Frith sent to me by the Rev. Walter Gregor. Natural size.

Fig. 10. — One of the skeleton spicula. × 250 linear.

Fig. 11.—A tension spiculum, from the dermal membrane. × 250 linear.

ISODICTYA DICHOTOMA, *Bowerbank.*

Vol. ii, p. 309, 'Mon. Brit. Spongiadæ.'

Fig. 12. — Represents the type-specimen of the species brought up by the trawl about a mile off Hastings. Natural size..

Fig. 13. — One of the skeleton spicula. × 250 linear.

Fig. 14.—A tension spiculum, from the interstitial membranes. × 250 linear.

ISODICTYA FISTULOSA, *Bowerbank.*

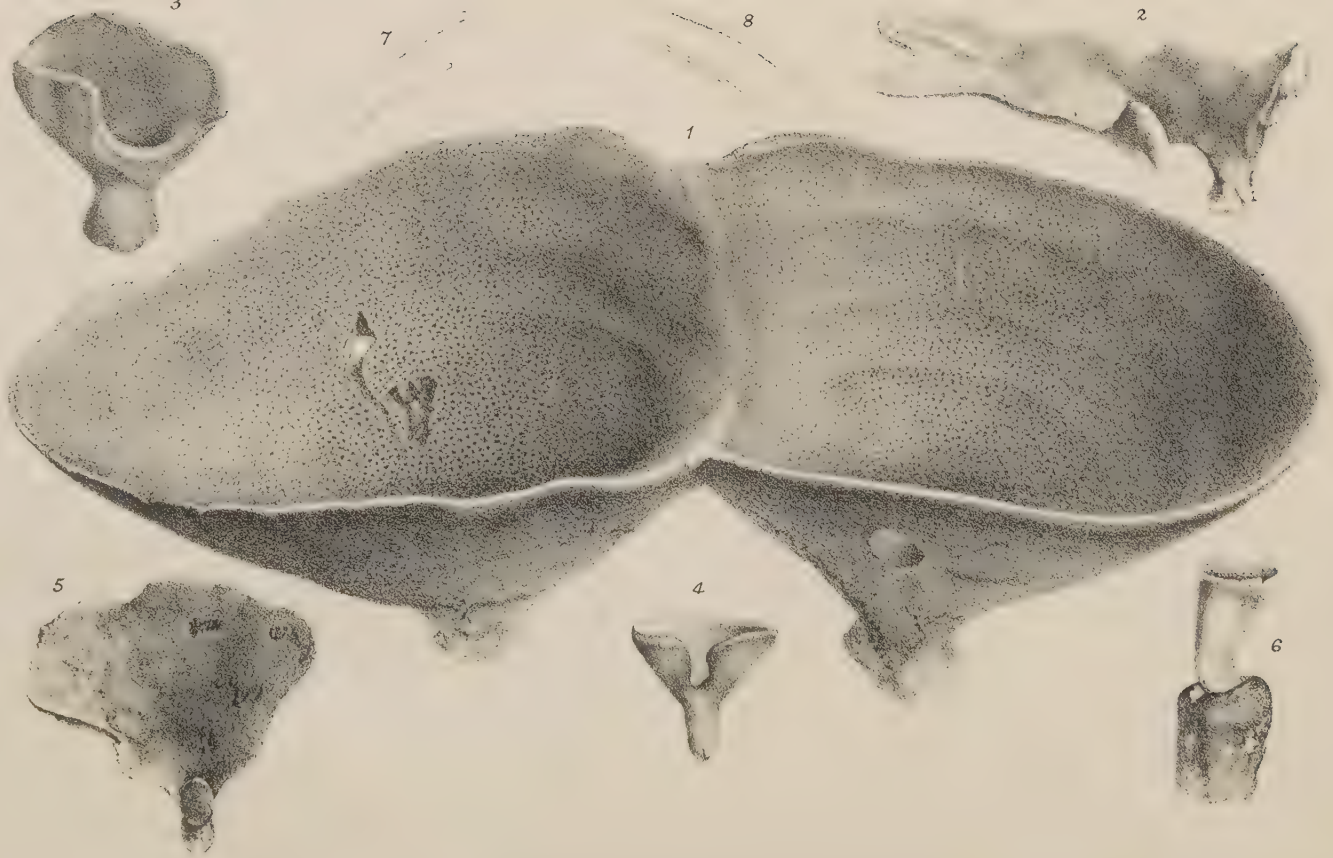
Vol. ii, p. 299, 'Mon. Brit. Spongiadæ.'

Fig. 15.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman.

Fig. 16.— One of the skeleton spicula. × 250 linear.

Fig. 17.—A tension spiculum, from the dermal membrane. × 250 linear.

Since fig. 15 was drawn I have found among some unexamined sponges from Shetland, by Mr. Barlee, a specimen of this species one and three quarters of an inch in length, rather less than an inch in breadth, and about half an inch in thickness. It agrees with the type-specimen in both external appearance and internal structure.



Isodictya infundibuliformis.

W. Lens Aldous del et lith.

W. West & Co. imp.

PLATE LIV.

ISODICTYA INFUNDIBULIFORMIS, *Bowerbank.*

Vol. ii, p. 317, 'Mon. Brit. Spongiadæ.'

Fig. 1. — Represents a remarkable specimen composed of two individuals of the ordinary funnel-like shape of this species, which have united by marginal contact in their young state, and have continued their development in this singularly conjoined condition, admirably illustrating the natural law that when two sponges of the same species come in contact with each other they unite and ultimately form one sponge. The specimen is in the dried condition, and the inner surface of each cup exhibits innumerable minute oscula. Natural size.

I am indebted to my kind friend Mr. Peach for this fine specimen.

Fig. 2.—An abnormous form of, apparently originally, a cup-shaped specimen; such distorted forms are of frequent occurrence. Figured from a specimen in the condition it came from the sea. Natural size. Shetland.

Fig. 3.— A small cup-shaped specimen, from the Hebrides, preserved in spirit as it came from the sea. Natural size.

Fig. 4.— A small cup-shaped specimen, from Loch Fine, preserved in spirit as it came from the sea. Natural size.

Fig. 5.—A small fan-shaped specimen, preserved in salt and water as it came from the sea at Shetland. Natural size. The fan-shaped specimens are of frequent occurrence, and are sometimes of considerable size.

Fig. 6.—A remarkably narrow cup-shaped specimen,

based on a black pebble, from Shetland, preserved in salt and water as it came from the sea. Natural size.

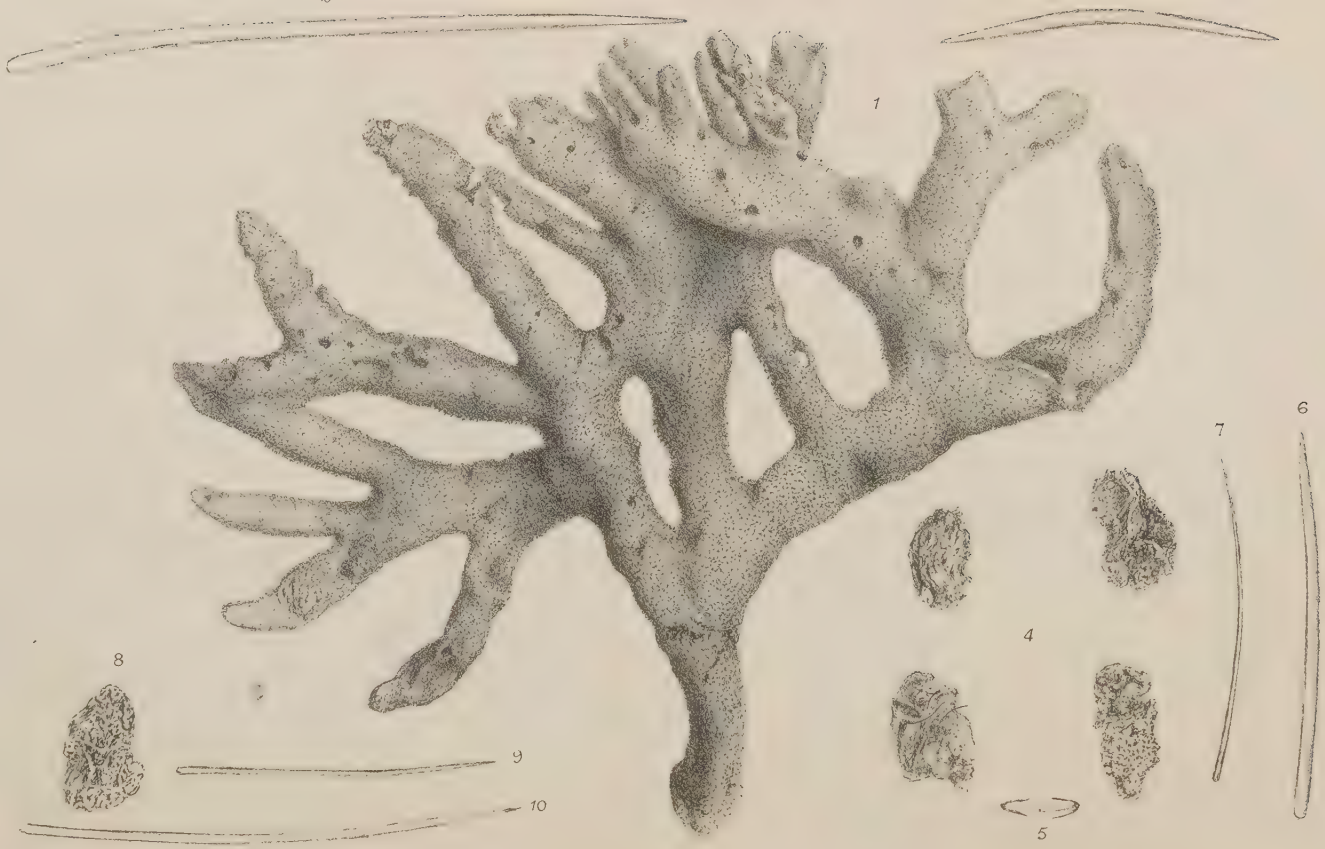
The oscula are rarely to be seen in specimens in the wet condition.

Fig. 7.—Two of the attenuato-acuate spicula, of the primary lines of the skeleton. × 80 linear.

Fig. 8.—Two of the acerate spicula, of the secondary lines of the skeleton. × 80 linear.

The two sizes of spicula represented by figs. 7 and 8 are about the largest and smallest of each form. The intermediate sizes are the most numerous.

Fig. 1, Plate XIV, in the present volume, exhibits a specimen of I. infundibuliformis containing a fine specimen of Tethea cranium. The sponges are in the condition in which they came from the sea, having been preserved in a saturated solution of salt in water. In this specimen the oscula are not so distinctly visible as in the dried one.



Isodictya dissimilis 1–3. I. paupera 4–7.
I. uniformis 8–10

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE LV.

Isodictya dissimilis, *Bowerbank.*

Vol. ii, p. 318, 'Mon. Brit. Spongiadæ.'

Fig. 1.—The type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 2.—A spiculum, from the primary lines of the skeleton. × 250 linear.

Fig. 3.—A spiculum, from the secondary lines of the skeleton. × 250 linear.

Since the first publication of this species I have received two other specimens; one from Mr. Wm. Thompson, of Weymouth, five inches high and three broad, and the other from Mr. W. Saville Kent, who dredged it in 1870, off Guernsey; this specimen is four inches high and three broad. All the specimens agree in having a short pedicel, and in the fan-like disposition of its branches. The external characters of the species appear to be tolerably constant and reliable.

Isodictya paupera, *Bowerbank.*

Vol. ii, p. 328, 'Mon. Brit. Spongiadæ.'

Fig. 4.—Represents four of the specimens of the species received from Mrs. Griffiths, of Torquay. Natural size.

Fig. 5.—One of the minute, bidentate, equi-anchorate, retentive spicula, from the dermal membrane. × 530 linear.

Fig. 6.—A skeleton spiculum. × 250 linear.

Fig. 7.—One of the slender, fusiformi-acerate, tension spicula of the interstitial membranes. × 250 linear.

Isodictya uniformis, *Bowerbank.*

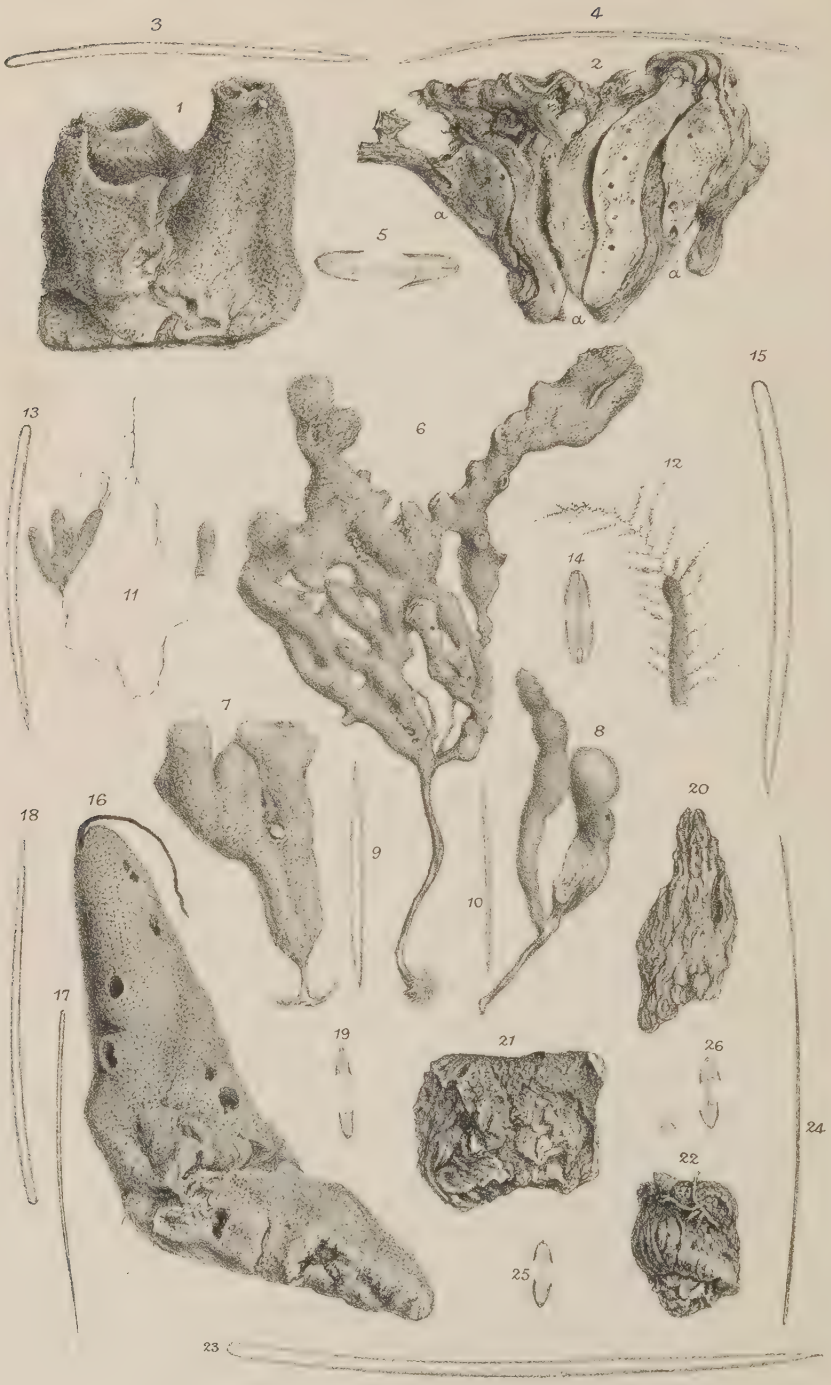
Vol. ii, p. 329, 'Mon. Brit. Spongiadæ.'

Fig. 8.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 9.—One of the tension spicula of the dermal membrane. × 250 linear.

Fig. 10.—A skeleton spiculum. × 250 linear.

Plate LVI.



Isodictya Normani 1–5. I. pygmea 6–10. I. Clarkei 11–15. I. fucorum 16–19. I. Alderi 20–26.

W. Lens Aldous del. et lith. W. West & C° imp.

PLATE LVI.

Isodictya Normani, *Bowerbank.*

Vol. ii, p. 320, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a specimen of the species from off St. Martin's Point, Guernsey, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 2.—Represents a specimen of the sponge growing amidst the roots of a large fucus from Moray Frith, presented to me by the Rev. Walter Gregor, of Aberdeen. *a a a* are the masses of the sponge. Natural size.

Fig. 3.—One of the stout, acuate spicula of the skeleton. × 250 linear.

Fig. 4.—A long slender, tension spiculum of the dermal membrane. × 250 linear.

Fig. 5.—A palmato-equi-anchorate, retentive spiculum, from the dermal membrane. × 1000 linear.

Isodictya pygmea, *Bowerbank.*

Vol. ii, p. 313, 'Mon. Brit. Spongiadæ.'

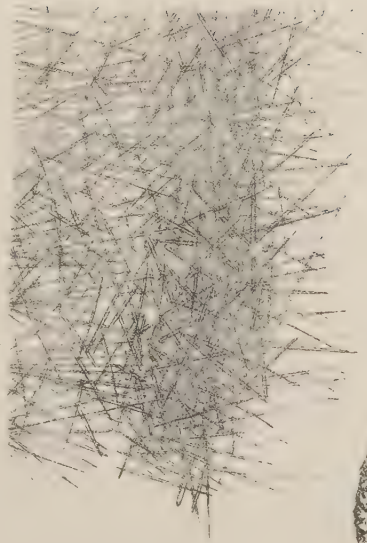
Fig. 6.—Represents the largest specimen of the species that I have yet seen. It was presented to me by my late friend Mr. Bean, of Scarborough. Natural size.

Figs. 7 and 8.—Two other specimens of the same species from Scarborough. I have several others of about the same size, which appears to be the average size of the species. Natural size.

Fig. 9.—A skeleton spiculum. × 250 linear.

Fig. 10.—One of the slender tension spicula of the interstitial membranes. × 250 linear.

Plate LVII.



Isodictya Barleei.

W. Lens Aldous del. et lith.

W. West & Co imp.

PLATE LVII.

Isodictya Barleei, *Bowerbank.*

Vol. ii, p. 333, 'Mon. Brit. Spongiadæ.'

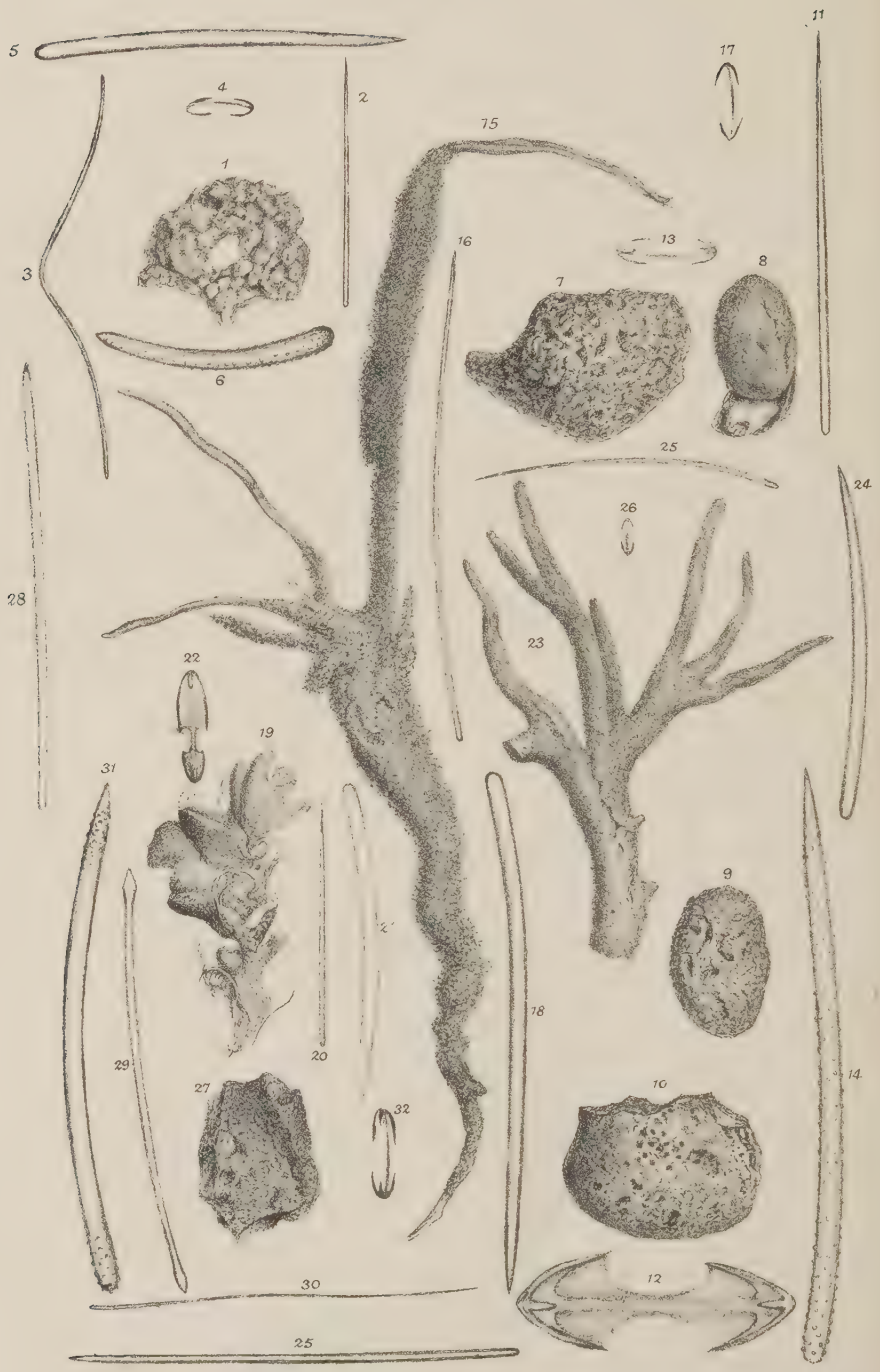
Fig. 1.—Represents a specimen of the species in the dried state, of the natural size, from the same locality as the previously described ones. I am indebted to my friend Mr. C. W. Peach for this very illustrative specimen.

Fig. 2.—Represents a small portion of a section at right angles to the surface of the sponge. × 80 linear.

Fig. 3.—One of the slender, acuate, tension spicula of the dermal membrane. × 80 linear.

Fig. 4.—One of the skeleton spicula. × 80 linear.

Plate LVIII.



Isodictya Beanii 1–6. I. fimbriata 7–14. I. Edwardii 15–18.
I. lobata 19–22. I. gracilis 23–26. I. lurida 27–32.

W. Lens Aldous del. et lith. W. West & Co. imp.

PLATE LVIII.

Isodictya Beanii, *Bowerbank.*

Vol. ii, p. 334, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the specimen I received from Mr. Bean. Natural size.

Fig. 2.—A slender, attenuato-acuate, tension spiculum from the dermal membrane. × 250 linear.

Fig. 3.—One of the slender, tricurvate, tension spicula from the dermal membrane. × 530 linear.

Fig. 4.—A minute, equi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 5.—One of the subfusiformi-acuate skeleton spicula from the primary lines. × 250 linear.

Fig. 6.—One of the acuate, entirely spined, short, skeleton spicula from the secondary lines of the skeleton. × 250 linear.

Isodictya fimbriata, *Bowerbank.*

Vol. ii, p. 337, 'Mon. Brit. Spongiadæ.'

Figs. 7, 8, 9, 10.—Represent specimens of the sponge, for which I am indebted to my friend the Rev. A. M. Norman, who dredged them at Shetland. Natural size. No. 8 is based on the remains of a small bivalve shell.

Fig. 11.—An acuate tension spiculum from the dermal membrane. × 250 linear.

Fig. 12.—One of the large, tridentate, bifimbriated, equi-anchorate, retentive spicula from the dermal membrane. × 530 linear. The fimbriation of these

spicula varies to some extent in the form of its development. Fig. 150, Plate VI, in vol. i of this work, represents one of these spicula in which the character of the fimbriation is somewhat different to that of fig. 12 in the present plate; both are from the same sponge. × 660.

Fig. 13.—A small, tridentate, equi-anchorate, retentive spiculum from the dermal membrane, without any trace of fimbriation. × 530 linear.

Fig. 14.—An entirely but incipiently-spined skeleton spiculum. × 250 linear.

Isodictya Edwardii, *Bowerbank.*

Vol. ii, p. 325, 'Mon. Brit. Spongiadæ.'

Fig. 15.—Represents the type-specimen of the sponge in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 16.—One of the long and slender acuate tension spicula from the dermal membrane. × 250 linear.

Fig. 17.—A bidentate, equi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 18.—One of the skeleton spicula. × 250 linear.

Isodictya lobata, *Bowerbank.*

Vol. ii, p. 326, 'Mon. Brit. Spongiadæ.'

Fig. 19.—Represents the specimen of the species I received from Mrs. Griffiths. Natural size.

Fig. 20.—A slender, acuate, tension spiculum from the dermal membrane. × 250 linear.

Fig. 21.—One of the skeleton spicula. × 250 linear.

Fig. 22.—An inequi-dentato-palmate, retentive spiculum from the interstitial membranes. × 530 linear.

Isodictya gracilis, *Bowerbank*.

Vol. ii, p. 331, 'Mon. Brit. Spongiadæ.'

Fig. 23. — Represents the type-specimen of the species. Natural size.

Fig. 24.—One of the skeleton spicula. × 250 linear.

Fig. 25.—An acuate, slender, tension spiculum from the interstitial membranes. × 250 linear.

Fig. 26. — One of the minute, bidentate, equi-anchorate, retentive spicula from the interstitial membranes. × 430 linear.

Isodictya lurida, *Bowerbank*.

Vol. ii, p. 336, 'Mon. Brit. Spongiadæ.'

Fig. 27.—Represents a small specimen of the species in a fine state of preservation, from Dunstanborough. In the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 28.—A tension spiculum from the dermal membrane, submucronate at one termination. × 250 linear.

Fig. 29.—A tension spiculum from the dermal membrane, with hastate terminations. × 250 linear.

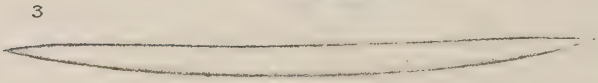
Fig. 30.—One of the long, slender, acuate, tension spicula. × 250 linear.

Fig. 31.—A skeleton spiculum, basally and apically spined. × 250 linear.

Fig. 32. — A tridentate, equi-anchorate, retentive spiculum from the interstitial membranes. × 530 linear.

The spicula of this description are frequently bidentate only.

Plate LIX.



Spongilla fluviatilis.

W. Lens Aldous del. et lith.

W. West & C° imp.

PLATE LIX.

SPONGILLA FLUVIATILIS, *Johnston*.

Vol. ii, p. 339, ' Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a specimen from the floating timber in the West Country Dock, near Rotherhithe, London, S.E. The surface has assumed a somewhat foliated appearance. Natural size.

Fig. 2.—A specimen from the same locality as that represented by fig. 1. The upper and the lower portions have been two distinct specimens which have united by approximation. This specimen, represents the usual massive character of the species. Natural size.

Fig. 3.—Represents an average-sized skeleton spiculum. × 250 linear.

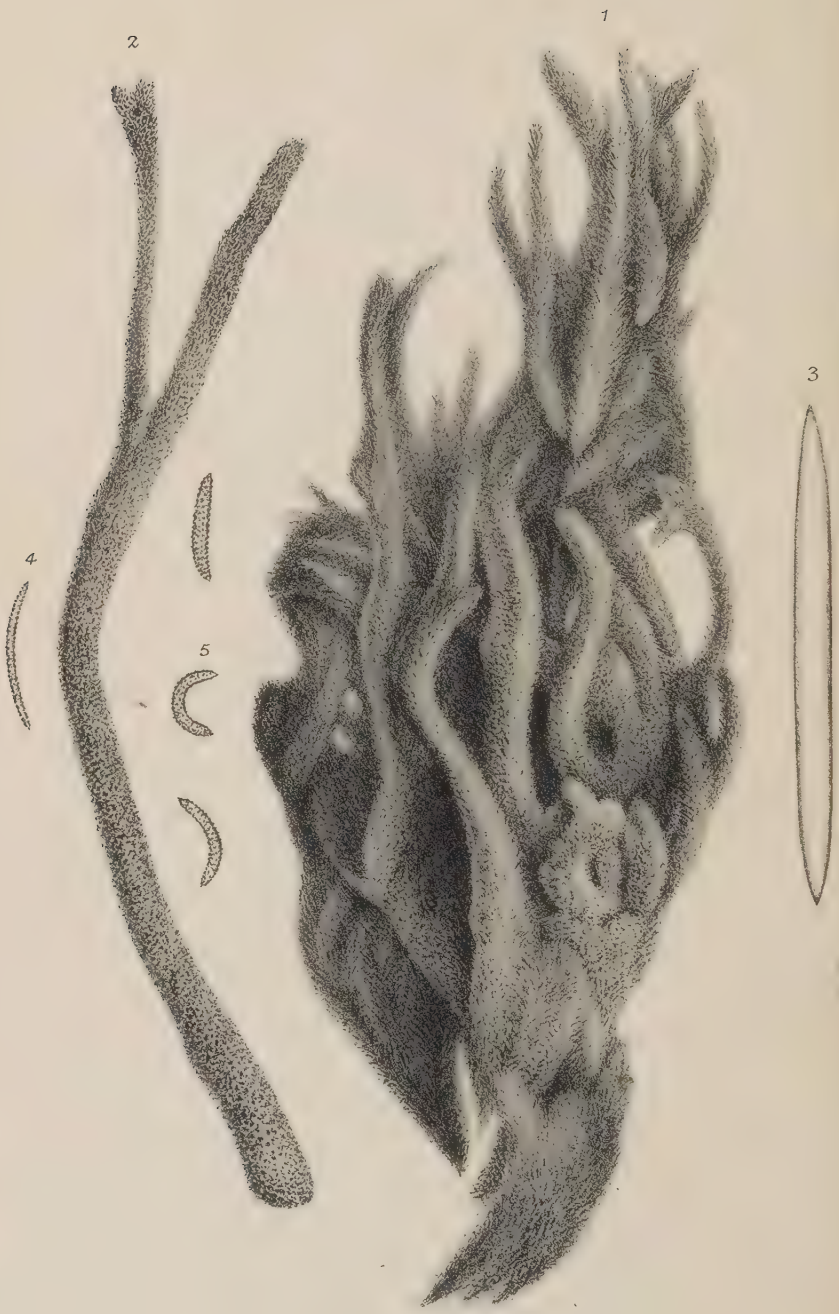
Plate XXII, fig. 317, vol. i, ' Mon. Brit. Spongiadæ,' represents an ovarium of this species in its natural state, exhibiting the foramen. × 83 linear.

Fig. 318.—Represents a perfect skeleton of one of the ovaries, prepared with nitric acid. × 183 linear.

Fig. 319.—Exhibits a section at right angles to the surface of a fragment of the skeleton of one of the ovaries, prepared by nitric acid, showing the relative positions of the rotulate spicula in the ovarium; (*a*) a detached spiculum from the same specimen. × 308 linear.

Plate IX, fig. 217, in the same volume, represents one of the rotulæ irregularly and deeply dentate. × 660 linear; fig. 218 in the same plate is a view of the external surface of one of the rotulæ. × 660 linear.

Plate LX.



Spongilla lacustris.

W. Lens Aldous, del. et lith.

W. West & Co imp.

PLATE LX.

SPONGILLA LACUSTRIS, *Johnston.*

Vol. ii, p. 342, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a specimen obtained from the Thames at Cookham, where such complex masses of the sponge are by no means uncommon. Natural size. Dried state.

Fig. 2.—A simple branching specimen from the same locality. Natural size. Dried state.

Fig. 3.—A skeleton spiculum. × 250 linear.

Fig. 4.— One of the fusiformi-acerate, entirely spined, tension spicula, from the dermal membrane. × 250 linear. Another of these spicula, × 660, is represented by fig. 90, Plate IV, vol. i, 'Mon. Brit. Spongiadæ.'

Fig. 5.— Three of the subarcuate, acerate, entirely spined spicula from the envelope of the ovary of this species, showing the great variations in form to which they are subject. × 250 linear. Another of these spicula is represented by fig. 203, Plate IX, vol. i, 'Mon. Brit. Spongiadæ.' × 660 linear.

Fig. 320, Plate XXII, in the same volume, represents an ovarium of *S. lacustris*, prepared by nitric acid so as to exhibit these spicula *in situ*. × 183 linear.

Plate LXI.

Desmacidon fruticosa.

W. West & Co. imp

PLATE LXI.

DESMACIDON FRUTICOSA, *Bowerbank.*

Vol. ii, p. 345, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a finè specimen of the species based on a large pebble from the Diamond Ground, off Hastings. Half the natural size.

Fig. 2.—An average-sized skeleton spiculum. × 250 linear.

Fig. 3.—One of the tension spicula of the dermal membrane. × 250 linear.

Fig. 4.—A large-sized, contort, bihamate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 5.—A small-sized, simple, bihamate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 6.—A large, bidentate, equi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 7.—One of the small, equi-anchorate, retentive spicula from the dermal membrane. × 530 linear.

Plate LXII.

Desmacidon Jeffreysii.

W. Lens Aldous del. et lith.

W. West & Co. imp

PLATE LXII.

Desmacidon Jeffreysii, *Bowerbank.*

Vol. ii, p. 347, 'Mon. Brit. Spongiadæ.'
Isodictya robusta, vol. ii, p. 304, 'Mon. Brit. Spongiadæ.'
Oceanapia Jeffreysii, Rev. A. M. Norman, 'Rep. Brit. Asoc.,' 1868, p. 334.

Fig. 1.—One of the most perfect specimens of the species that has been obtained. It was dredged by the Rev. Mr. Norman at Shetland in the summer of 1868. It is firmly attached to a small fragment of stone by five stout, root-like, prehensile organs. Natural size.

Fig. 2.—A small specimen of the species, without any portion of the base. Natural size.

Fig. 3.—A portion of one of the large, terminal, cloacal organs, having a branch projecting from its side. The wart-like bodies opposite *a*, *a*, *a*, are *Zoanthus sulcatus?* Gosse. On the large cloacæ of two of the specimens sent to me by Mr. Norman the number of these parasites is very considerable.

Fig. 4.—A portion of the distal extremity of a large specimen of the species from among the fragments sent to me by Mr. Peach, with the remains of eleven or more projecting cloacæ.

Fig. 5.—One of the acerate skeleton spicula. × 250 linear.

The general description of this species, p. 347, vol. ii, 'Mon. Brit. Spongiadæ,' is correct as far as it goes, but the recent acquisition by the Rev. A. M. Norman of several nearly perfect specimens, and repeated observations of the numerous fragments sent to me by Mr. Peach, have enabled me to add further informa-

tions from the apex of the sponge, rather exceeding ten lines in diameter, had probably been not less than four inches in height.

The habit in this species of discharging the fecal streams by means of large cloacæ is quite in accordance with that of the nearly allied British species *D. fruticosa*.

This species is one of the very few sponges in which a section at right angles to the surface in the dried state does not give a good illustration of its structure; a portion of the longitudinal run of the skeleton affords a much more correct idea of its anatomical characters, and these are very much more developed in the thickened base and apex of the bulb of the sponge, and in the stout prehensile and cloacal organs.

Sections of the dried mass of interstitial membranes and sarcode that had subsided within the outer crust of the sponge during its drying afforded but very little information regarding its mode of disposition and structure; but from one of the large fragments sent to me by Mr. Peach I obtained sections at right angles to the surface of the sponge, which presented every indication of the tissues having retained their natural characters and positions.

There was every indication of the membranes having been arranged in lines radiating from the centre to the circumference of the sponge, the greater portion of the numerous tension spicula assuming that direction, with comparatively a few others dispersed among them at various angles. There were also innumerable gemmules in a fine state of preservation evenly dispersed on the membranes. These organs with a linear power of 700 are distinctly seen to be filled with minute granules. The average diameter of the gemmule was $\frac{1}{1500}$ inch. Amidst these were also an abundance of minute, simple, and contort, bihamate retentive spicula, exceedingly minute, and very liable to escape observation amidst the sarcode unless examined with a power of about 1000 linear. The length of one of the

largest of these spicula was $\frac{1}{2143}$ inch, and its greatest thickness at the middle of the shaft did not exceed $\frac{1}{25000}$ inch.

The dermal membrane from the same piece of the sponge was also abundantly furnished with the minute, bihamate, retentive spicula.

It is a singular but very characteristic fact that the same forms of retentive spicula are abundant in all the seven other species of British Desmacidon with which I am acquainted.

The additional information regarding the external characters and the anatomical peculiarities requires an amended specific character; I therefore propose to substitute the following one in place of that in p. 347, vol. ii, 'Mon. Brit. Spongiadæ.'

In the 'Report of the British Association' for 1868, p. 334, "On Dredging among the Shetland Islands," the Rev. Mr. Norman has proposed to separate *Desmacidon Jeffreysii* and make it the type of a new genus under the designation of Oceanapia, from the similarity in form of the bulbous mass of the sponge to a Swede turnip; but unfortunately for the propriety of this character as the foundation of a genus there are numerous other sponges of a similar form, both British and exotic, which vary so greatly in their anatomical structure as to render it quite out of the question that they should be grouped together in the same genus. On the contrary, if anatomical similarity of structure is to be assumed as the natural basis of generical arrangement, the sponge under consideration cannot with propriety be referred to any other genus than Desmacidon. The striking peculiarity of this genus is such, that when a proper section of it is submitted to microscopical examination, it is immediately referable to its proper position in the generic arrangement. The essential character is, that the skeleton is entirely composed of multispiculated keratose fibres, which in all the known British species of the genus form irregularly reticulated skeletons.

Desmacidon Jeffreysii.

Sponge massive, more or less spherical, externally, crustaceous; internally, a mass of interstitial membranes abundantly furnished with spicula; basally attached to rocks or stones by stout, prehensile, root-like organs; apically furnished with large and small penicillate tubular cloacæ. Surface smooth. Oscula within the cloacæ. Pores inconspicuous. Dermal membrane pellucid, furnished with a unispiculous reticulation. Spicula same as those of the skeleton; retentive spicula bihamate, simple and contort, abundant and very minute. Skeleton stout, coarse, and elongately diffuse; spicula acerate, rather short and stout. Interstitial mass, membranes abundantly spiculous, without admixture of spiculo-fibrous structure; spicula of the membranes same as those of the skeleton; retentive spicula, simple and contort bihamate, very abundant, exceedingly minute. Gemmules membranous.

Dried.—Light buff colour,

Hab.—Shetland; Mr. C. W. Peach and Rev. A. M. Norman.

Examined.—In the dried state.

Plate LXIII.

Desmacidon Peachii 1–7.
D. ægagropila 8–14.

W. Lens Aldous del et lith

W. West & Co imp.

PLATE LXIII.

Desmacidon Peachii, *Bowerbank.*

Vol. ii, p 349, 'Mon. Brit. Spongiadæ.'

Fig. 1—Represents the type-specimen received from Mr. Peach. Natural size.

Fig. 2.—A skeleton spiculum of about the average size. × 80 linear.

Fig. 3.—A long and very slender acerate tension spiculum from the interstitial membranes. × 530 linear. The normal form of these spicula is very slightly curved, but they are frequently more or less sinuous, and sometimes curved at one of their extremities, as represented in the figure.

Fig. 4.—One of the short and somewhat stout tension spicula of the dermal membrane. × 530 linear. These spicula are also very abundant on the interstitial membranes.

Fig. 5.—A large and somewhat contort, bihamate, retentive spiculum from the interstitial membranes. × 530 linear.

Fig. 6.—A large, reversed, simple, bihamate, retentive spiculum from the interstitial membranes. × 530 linear.

Fig. 7.—One of the smallest bihamate, retentive, spicula from the interstitial membranes. × 530 linear.

Desmacidon ægagropila, *Bowerbank.*

Vol. ii, p. 352, 'Mon. Brit. Spongiadæ.'

Fig. 8.—Represents a specimen of the species on a slender-branching Fucus from Brighton. Natural size.

Fig. 9.—A specimen from Strangford Lough, Ireland, sent to me by Prof. Dickie. Natural size.

Fig. 10.—A full-sized skeleton spiculum. × 250 linear.

Fig. 11.—A tension spiculum from the dermal membrane. × 250 linear.

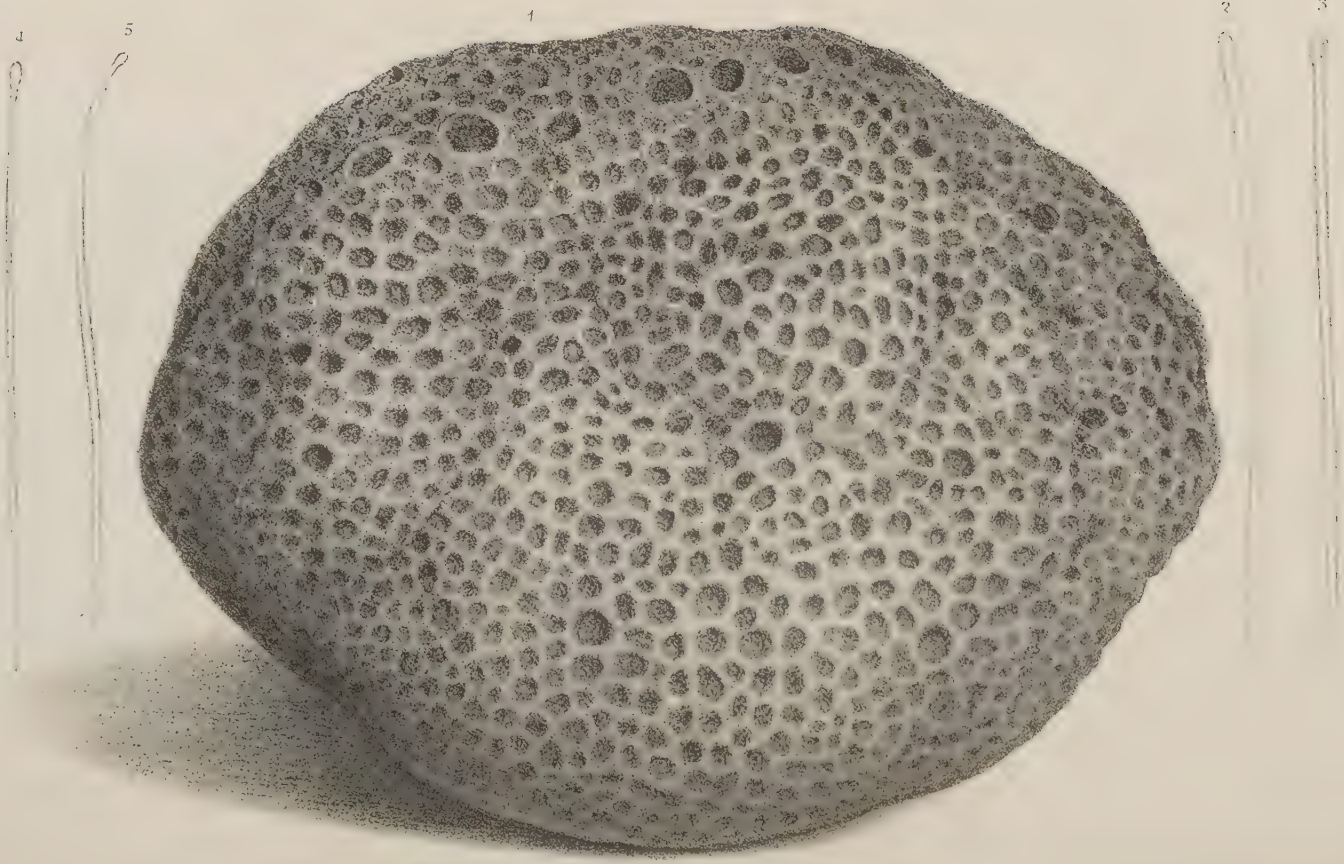
Fig. 12.—One of the contort, bihamate, retentive spicula from the dermal membrane. × 530 linear.

Fig. 13.—A reversed, bihamate, retentive spiculum from the dermal membrane, × 530 linear.

Fig. 14.—A dentato-palmate, inequi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

In vol. i, Plate XIII, figure 264, there is a fibre of the skeleton of this species represented. × 108 linear.

Plate LXV.



Raphyrus Griffithsii 1–5.

W.Lens Aldous del. et lith.

W. West & Co. imp.

PLATE LXIV.

Raphyrus Griffithsii, *Bowerbank.*

Vol. ii, p. 354, 'Mon. Brit. Spongiadæ.'

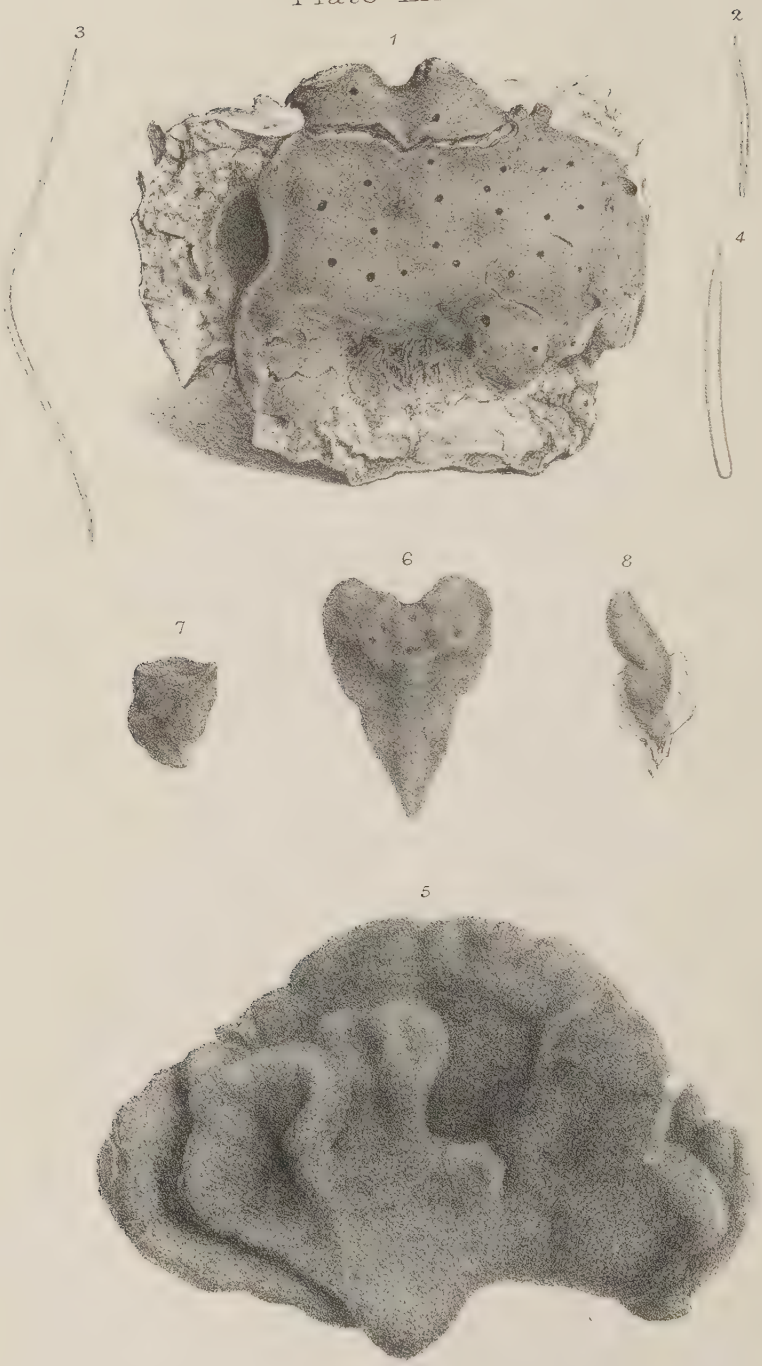
Fig. 1.—Represents a specimen seated on the shell of a large oyster, which it overlaps on every side. The whole of the sponge is thickly studded with inhalent areas, while at the upper portion of the figure there are a number of large oscula in an irregularly curved line. Natural size.

Figs. 2 and 3.—Spicula of the skeleton. × 250 linear.

Figs. 4 and 5.—Spicula of the interstitial membranes. × 250 linear.

Vol. i, Plate XIII, fig. 265, represents a portion of a small skeleton fibre composed of innumerable spicula, irregularly mixed. × 175 linear.

Plate LXV.



Ophlitaspongia seriata 1 - 4.
Spongionella pulchella 5 - 8.

W. Lens Aldous del et lith

W. West & Co

PLATE LXV.

Ophlitaspongia seriata, *Bowerbank.*

Vol. ii, p. 376, ' Mon. Brit. Spongiadæ.'

Chalina seriata, Bowerbank.

A reconsideration of the structure of the skeleton of this sponge has convinced me that its proper place is in the genus Ophlitaspongia. The fibres of its skeleton are exterspiculate, while those of every species of British Chalina are interspiculate, an important anatomical difference that naturally assigns them to different genera.

Fig. 1.—Represents a fine specimen based on a piece of rock, from one of the small caves of St. Katherine's Rock, Tenby. Natural size.

Fig. 2.—One of the subfusiformi, acuate, slender tension spicula of the dermal membrane. × 250 linear.

Fig. 3.—A slender, tricurvate, acerate tension spiculum from the dermal membrane. × 530 linear.

Fig. 4.—One of the large, internal, defensive spicula based on the skeleton-fibre of the sponge. × 250 linear.

In vol. i, Plate XVII, fig. 287, a portion of a thin section of the sponge at right angles to the surface, × 108 linear, illustrating the form of the Keratose skeleton, and the mode of disposition of the internal defensive spicula on its fibre.

I have received from Mr. C. W. Peach a specimen of this species from Fowey; it surrounds the stem of a Fucus for seven inches of its length.

Spongionella pulchella, *Bowerbank.*

Vol. ii, p. 359, ' Mon. Brit. Spongiadæ.'

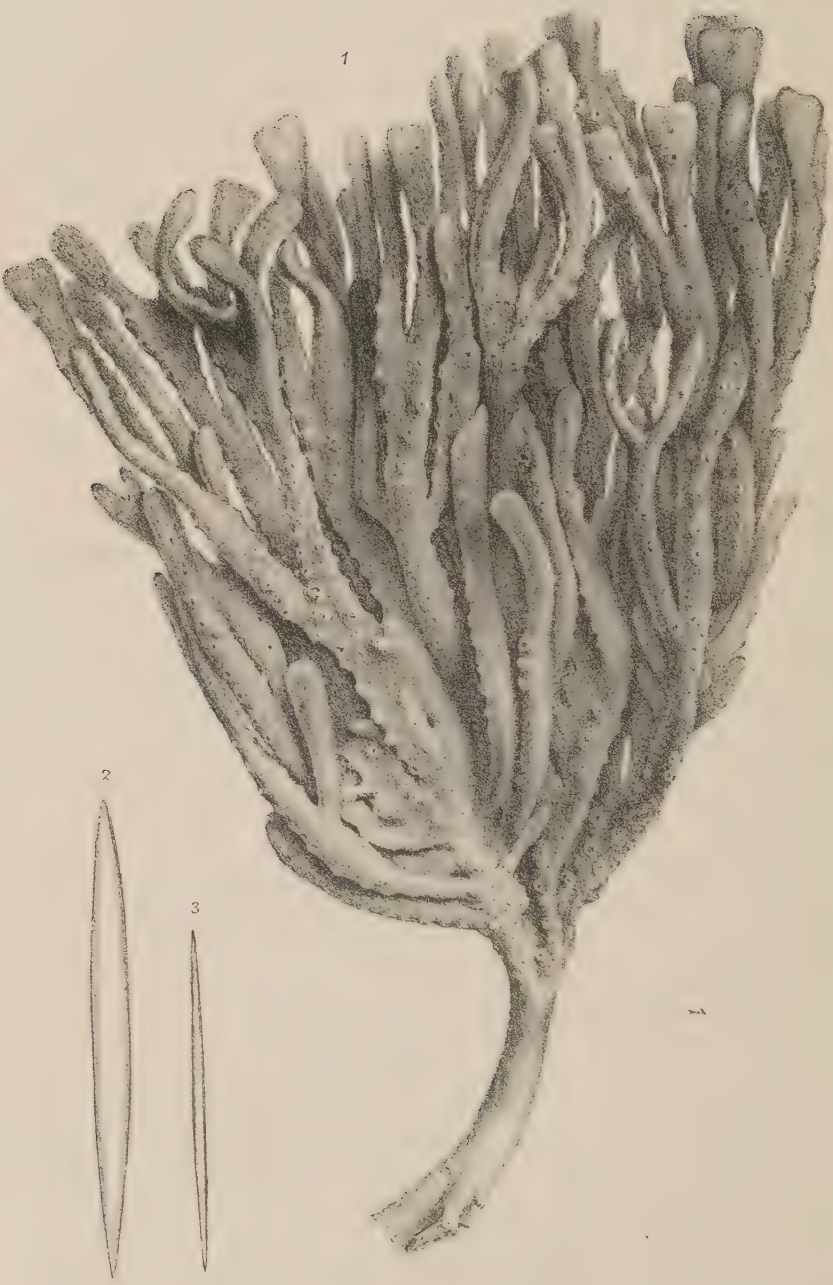
Fig. 5.—Represents the type-specimen of the species

from the coast of Ireland, by Mr. Robert Brown, figured in Sowerby's 'British Miscellany,' xliii. The specimen is now in my possession. Natural size.

Figs. 6, 7, and 8.—Three small specimens of the species from 70 fathoms, Shetland. Natural size.

Vol. i, Plate XXXVII, fig. 380, represents a portion of a section of the sponge from the type-specimen at right angles to the surface. × 50 linear.

Plate LXVI.



Chalina oculata.

W. Lens Aldous del. et lith.

W. West & Cº imp.

PLATE LXVI.

CHALINA OCULATA, *Bowerbank.*

Vol. ii, p. 361, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a fine specimen of the species from the Diamond Ground, off Hastings, received in the living state, but drawn from the dried specimen very slightly reduced in size.

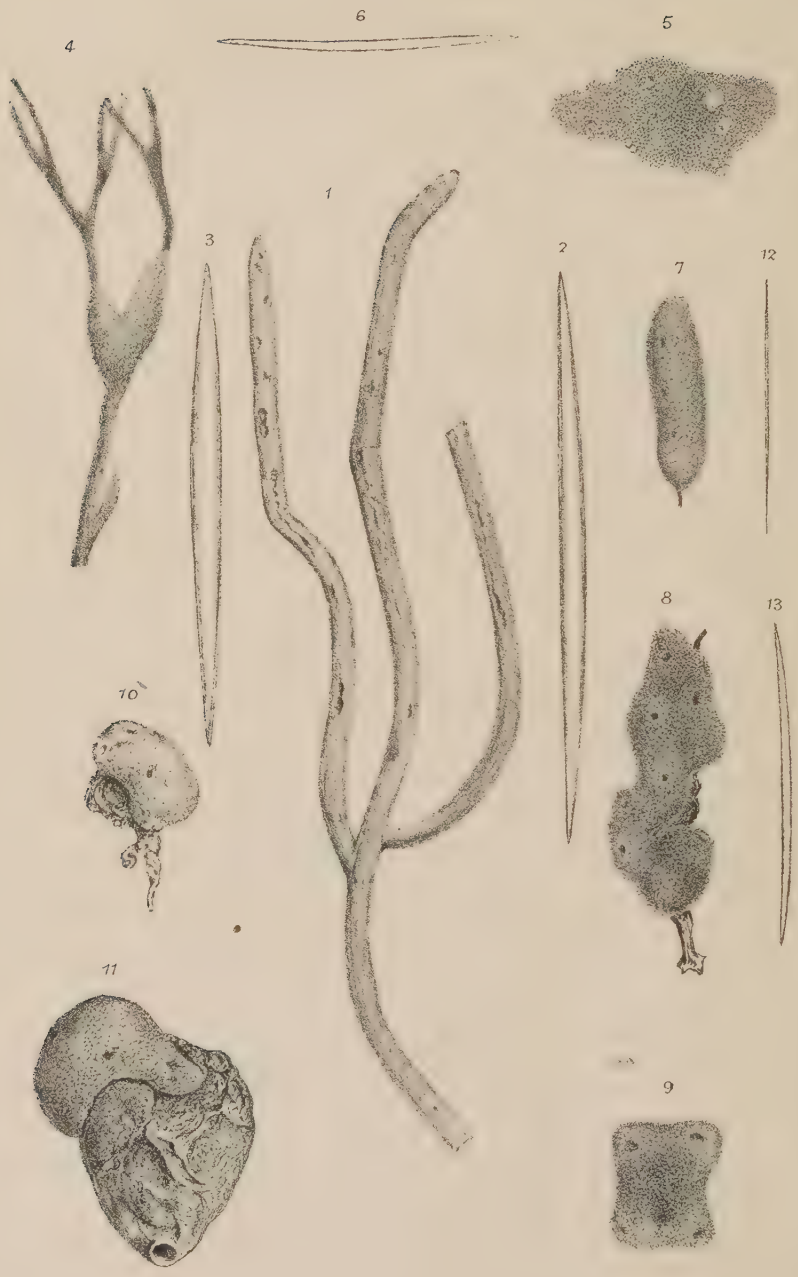
Fig. 2.—A skeleton spiculum. × 530 linear.

Fig. 3.—A tension spiculum from the dermal membrane. × 530 linear. The tension spicula of the interstitial membranes are precisely the same in size and form as those of the dermal membrane.

I have seen this sponge in rock caverns between high and low water in a living state, usually in a pendulous position, but I have two specimens based on the flat upper shell of two large *Pecten maximus*, four or five inches in height, which I received in the living condition, full of sarcode, and they maintained the upright position as rigidly as if they were sprigs of wood. In the skeleton state, with the sarcode removed by maceration in the sea, as we so frequently find it thrown up on the beach, it is familiar to us all as especially soft and flexible.

In vol. i, Plate XIII, fig. 262, the spiculous Keratose fibre of this species is represented. × 175 linear.

Plate LXVII.



Chalina cervicornis 1–3. C. gracilenta 4–6.
C. limbata 7–13.

W. Lens Aldous, del. et lith.

W. West & Co. imp.

PLATE LXVII.

Chalina cervicornis, *Bowerbank.*

Vol. ii, p. 364, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents a specimen found at Torquay by Mr. Gosse, who kindly presented it to me in the dried state. Natural size.

Fig. 2.—A skeleton spiculum from the specimen represented by fig. 1. × 530 linear.

Fig. 3.—A spiculum from the skeleton fibre of the type-specimen in the Johnston Collection of British sponges in the British Museum. Figured in Plate V, fig. 1, 'Johnston's British Sponges.' × 530 linear.

The figured specimen is apparently younger than the type one in the British Museum, and in consequence of the presence of a quantity of sarcode the colour is different; it is of a full orange-yellow. The spicula, on an average, are rather less stout than those of the type-specimen, but there is so much variation in that character that those represented by figs. 2 and 3 might readily be found among the spicula from either specimen.

Chalina gracilenta, *Bowerbank.*

Vol. ii, p. 372, 'Mon. Brit. Spongiadæ.'

Fig. 4.—Represents the type-specimen on *Codium tormentosum*, from the cabinet of the late Mrs. Griffiths. Natural size.

Fig. 5.—Represents a specimen from North Devon in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 6.—A skeleton spiculum from the type-specimen. × 530 linear.

Chalina limbata, *Bowerbank.*

Vol. ii, p. 373, 'Mon. Brit. Spongiadæ.'

Figs. 7, 8, 9, and 10.—Various forms of the species from the coast of Cornwall. Natural size.

Fig. 11.—A specimen of the species on a Terebratula from Fowey, by Mr. C. W. Peach. Natural size.

Fig. 12.—One of the slender dermal spicula. × 530 linear.

Fig. 13.—A skeleton spiculum. × 530 linear.

Chalina Flemingii 1-2. C. Montaguii 3-5.
C. Grantii 6. 7.

W. Lens Aldous del et lith

W. West & Co imp.

PLATE LXVIII.

Chalina Flemingii, *Bowerbank.*

Vol. ii, p. 370, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen parasitical on a slender Fucus. Natural size.

Fig. 2.—A full-sized spiculum from the fibre of the sponge. × 530 linear.

Chalina Montagui, *Bowerbank.*

Vol. ii, p. 366, 'Mon. Brit. Spongiadæ.'

Figs. 3 and 4.—Specimens obtained at Brighton by Mr. Thomas Ingall. Natural size.

Fig. 5.—A spiculum from the fibre of the sponge. × 530 linear.

Chalina Grantii, *Bowerbank.*

Vol. ii, p. 375, 'Mon. Brit. Spongiadæ.'

Fig. 6.—Represents the type-specimen found by Mr. Thomas Ingall at Brighton. Natural size.

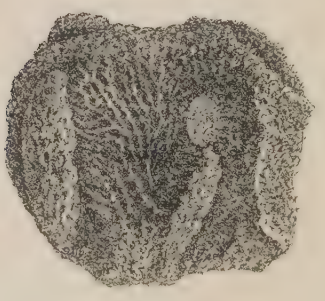
Fig. 7.—One of the spicula from the skeleton fibre. × 530 linear.

Plate LXIX.

1

2

3



Dysidea fragilis.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE LXIX.

DYSIDEA FRAGILIS, *Johnston.*

Vol. ii, p. 381, 'Mon. Brit. Spongiadæ.'

Fig. 1.—A fine specimen of the sponge from the Diamond Ground, off Hastings. Natural size.

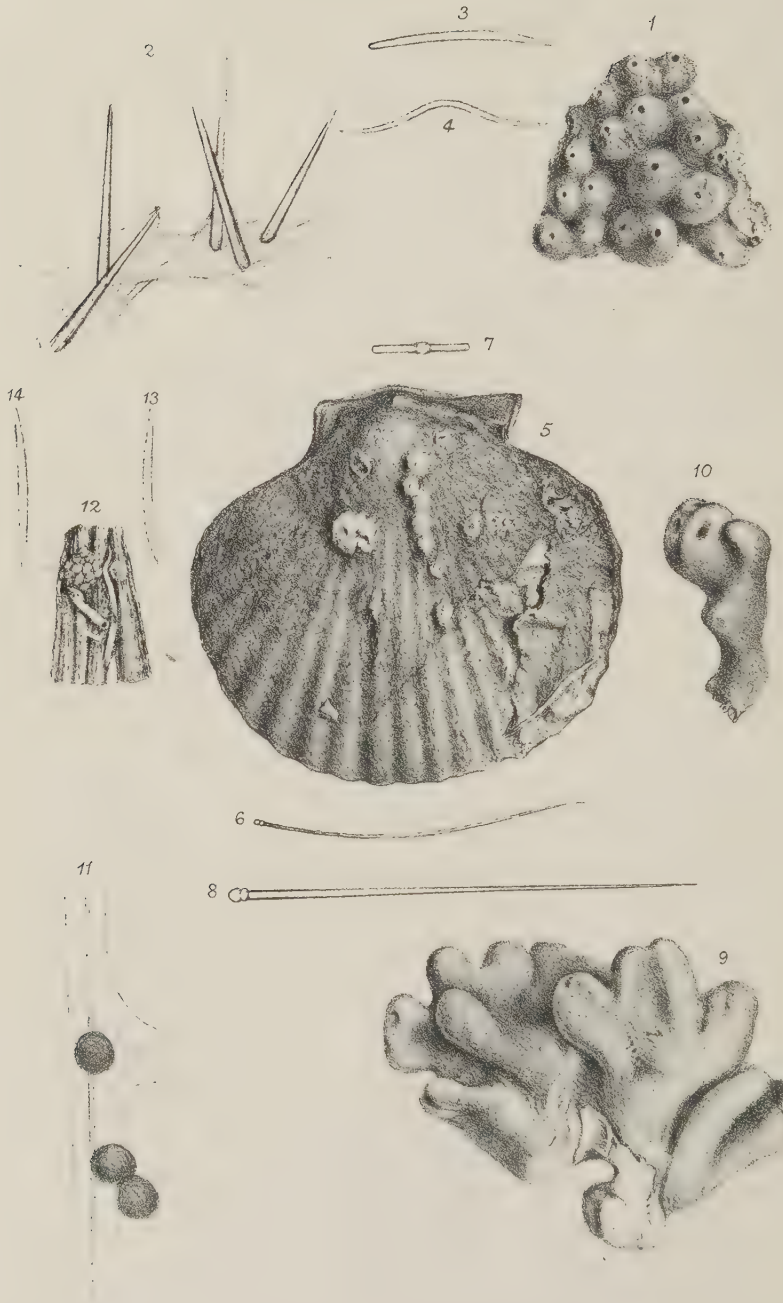
Fig. 2.—A specimen located on the back of apparently *Pisa Gibbsii*, Leach. The sponge is in a very fine state of preservation. Natural size.

Fig. 3.—A small well-developed specimen from the rocks off Hastings. Natural size.

Vol. i, Plate XIV, fig. 271, represents a few fibres of the sponge from a Hastings specimen, exhibiting the mode of the embedment of the sand amid the fibres. × 108 linear.

Fig. 272 in the same plate represents a single young fibre of the skeleton from the same sponge, exhibiting the manner in which the Keratose fibre picks up and incorporates the single grains of sand in forming its skeleton of extraneous materials.

Plate LXX.



Ophlitaspongia papillata 1-4. Halichondria farinaria 5-8.
Verongia Zetlandica 9-11. Diplodemia vesicula 12-14.

W. Lees Aldous del. et lith
W. West & Co. imp.

PLATE LXX.

Ophlitaspongia papilla, *Bowerbank.*

Vol. ii, p. 378, 'Mon. Brit. Spongiadæ.'

Fig. 1.—Represents the type-specimen, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 2.—A small piece of the skeleton fibre with its spicula *in sitú*. × 250 linear.

Fig. 3.—One of the fusiformi-acuate tension spicula of the dermal membrane. × 250.

Fig. 4.—A tricurvate, acerate, tension spiculum from the dermal membrane. × 250 linear.

Halichondria farinaria, *Bowerbank.*

Vol. ii, p. 269, 'Mon. Brit. Spongiadæ.'

Fig. 5.—Represents a fine specimen of the species from Strangford Lough coating a valve of *Pecten opercularis*. Natural size.

Fig. 6.—One of the slender spinulate spicula of the dermal membrane. ×250 linear.

Fig. 7.—An inflato-cylindrical tension spiculum from the dermal membrane. × 530 linear.

Fig. 8.—A skeleton spiculum. × 250 linear.

Verongia Zetlandica, *Bowerbank.*

Vol. ii, p. 380, 'Mon. Brit. Spongiadæ.'

Fig. 9.—Represents the largest and best developed specimen of the species from Shetland, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 10.—A smaller specimen from the same locality. Natural size.

Fig. 11.—A small portion of the fibre exhibiting the

central canal and three gemmules attached to the skeleton fibre. × 250 linear.

In a specimen examined since the publication of the description of this sponge in vol. ii, p. 380, 'Mon. Brit. Spongiadæ,' I have observed numerous gemmules attached to the fibres of the skeleton and to the inner surface of the dermal membrane. They are membranaceous and aspiculous, oval or spherical, and they vary considerably in size, some of them being not more than half the diameter of the largest ones. Their general appearance is very like that of the greater number of the gemmules of the Halichondraceous sponges.

DIPLODEMIA VESICULA, *Bowerbank.*

Vol. ii, p. 357, 'Mon. Brit. Spongiadæ.'

Fig. 12.—Represents the type-specimen of the species on the fragment of a valve of a pecten. A group of the ovaries is to be seen opposite (*a*). Natural size.

Fig. 13.—One of the spicula in the fibrous part of the skeleton. × 250 linear.

Fig. 14.—A spiculum from the reticulated part of the skeleton. × 250 linear.

In vol. i, Plate XXXVI, fig. 377, a portion of the compound reticulate skeleton is represented exhibiting the intermixture of the spiculo-reticulate skeleton with the hetro-spiculate fibrous one. × 108 linear.

In Plate XIV, fig. 273, the same volume, there is a small piece of the hetro-spiculated keratose fibre of the skeleton figured. × 175 linear.

In Plate XXIII, fig. 324, two of the ovaria are represented. × 83 linear.

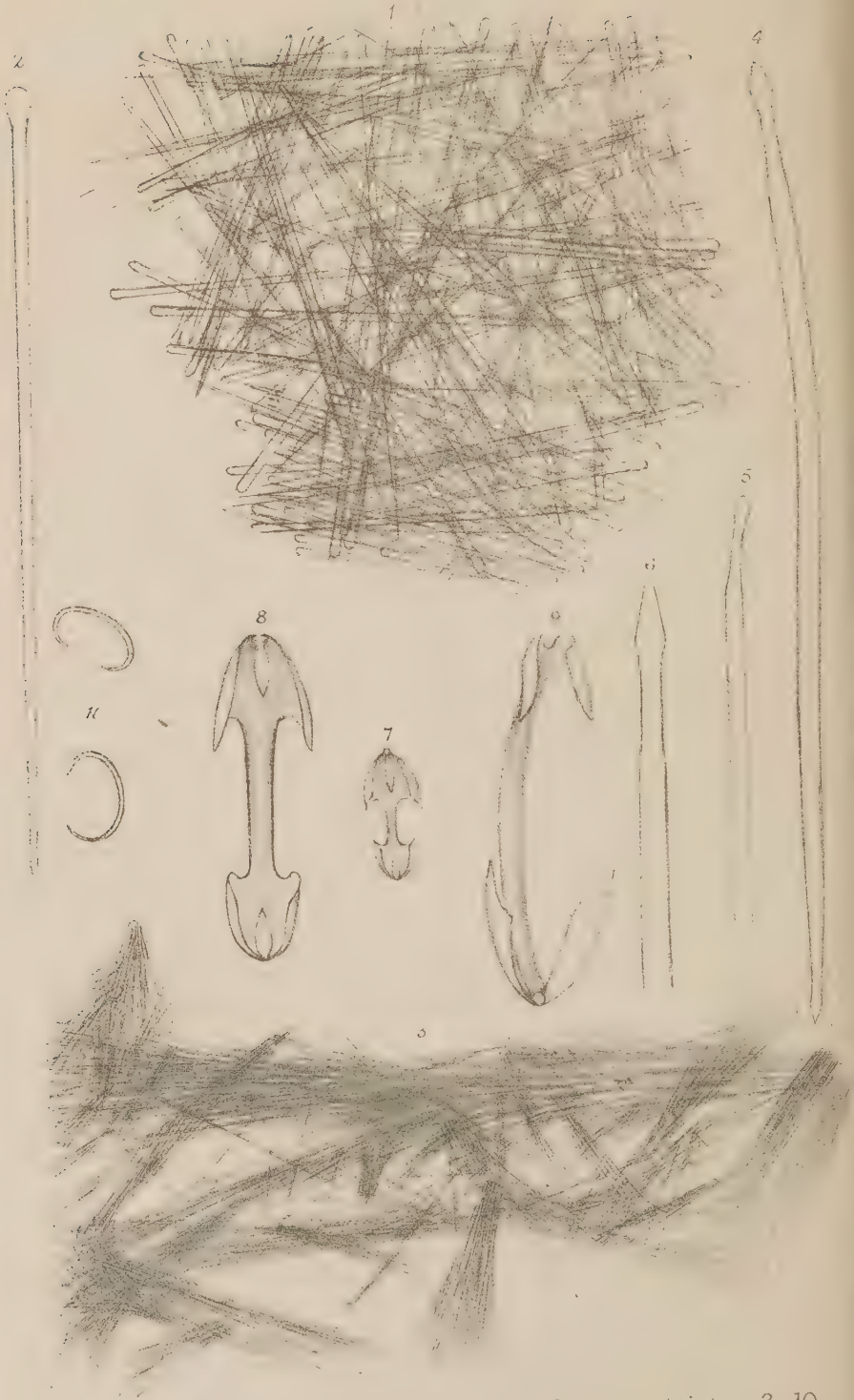
SUPPLEMENT

TO

VOL. II, 'MONOGRAPH OF BRITISH SPONGIADÆ.'

The following portion of the work is descriptive and illustrative of new species of British Sponges that have been discovered since the publication of vol. ii, and also of a few species that were published in that volume which it has been thought advisable, upon a reconsideration of their structures and of the characters first assigned to them, to remove to other Genera, with which their anatomical peculiarities were more closely in accordance. To these alterations of Genera the descriptions of the respective plates will readily lead the student.

Plate LXXI.



Hymeniacidon foliatus 1-2. Desmacidon constrictus 3-10

W. West & Co imp.

W. Lens Aldous del. et lith.

PLATE LXXI.

Hymeniacidon foliatus, *Bowerbank.*

Fig. 1.—Represents a portion of the skeleton of the type-specimen, exhibiting the mode of the arrangement of the skeleton structure. × 123 linear.

Fig. 2.—A fully-developed spinulate skeleton spiculum. × 250 linear.

Desmacidon constrictus, *Bowerbank.*

Vol. ii, p. 350, 'Mon. Brit. Spongiadæ.'

Fig. 3.—Represents a portion of the skeleton structure of the type-specimen of the species, exhibiting the large size of its multi-spiculous skeleton fibres, and a portion of the interstitial membrane and its dispersed tension spicula. × 36 linear.

Fig. 4.—One of the subfusiformi-acuate skeleton spicula, exhibiting its basal constriction. × 250 linear.

Fig. 5.—The basal portion of another skeleton spiculum showing a still greater amount of constriction. × 250 linear.

Fig. 6.—Another basal portion of a skeleton spiculum with a hastate basal termination. × 530 linear. This form of the base prevails in a more or less degree in a considerable number of the skeleton spicula.

Fig. 7.—A small dentato-palmate inequi-anchorate spiculum. × 530 linear.

Fig. 8.—One of the large dentato-palmate inequi-anchorate spiculum. × 530 linear.

Fig. 9.—A large bidentate inequi-anchorate spiculum. × 530 linear. This form often occurs along with the dentato-palmate ones.

Fig. 10.—Two of the contort, bihamate, retentive spicula. × 530 linear.

Hymeniacidon foliatus, *Bowerbank.*

Plate LXXI.

Sponge sessile, basal portion comparatively large and spreading; elevated portion folious; surface smooth. Oscula and pores inconspicuous. Dermal membrane pellucid, thin, aspiculous. Skeleton. Spicula more or less spinulate, of nearly equal size, very abundant, loosely and irregularly disposed.

Colour.—Cream white in the wet state.

Habitat.—Shetland; Mr. C. W. Peach.

Examined.—In the wet state from spirit.

I received a single specimen of this species with several other sponges in spirit from my kind and indefatigable friend Mr. C. W. Peach, who obtained it at Shetland in 1864. It is seated on a small pebble not quite eight lines long by about five lines wide. The basal mass of the sponge spreads comparatively to a considerable extent over one end of the stone, and the folious portion rises from it in the form of a thin, pointed, and somewhat curved leaf-like plate, about two and a half lines in greatest breadth, rather less than four lines in height, and of a thickness not exceeding that of a stout sheet of writing paper. It is very probable that hereafter considerable modifications both as regards size and form may be found to exist in this species, but as far as we can see at present it cannot, by its structural peculiarities, be referred to any of the British Hymeniacidons with spinulate spicula with which we are acquainted.

The sponge though so small is apparently not in an early stage of development; as there are, in the small piece removed for microscopical examination, not exceeding two lines in diameter, six foraminiferous shells, some of them containing their own animal matter, and there are others observable in the folious portion of the sponge.

I could not detect oscula or pores either on the piece

mounted in Canada balsam or on the general mass of the sponge.

The dermal membrane is aspiculous closely enveloping the mass of the sponge.

The whole substance of the sponge is composed of a loosely and irregularly disposed stratum of spicula, lying to a great extent in the same plain, but crossing each other in every imaginable direction. The spicula are of nearly the same size, and of but one form, all being more or less spinulate. In some of them the spinulation is fully and completely developed, while in others it is quite in an incipient condition, and every gradation of development between the two extremes may be observed.

The interstitial membranes are very translucent, and without the assistance of the minute molecules of extraneous matters upon them would scarcely have been detected.

Desmacidon constrictus, *Bowerbank.*

Vol. ii, p. 350, 'Mon. Brit. Spongiadæ.'

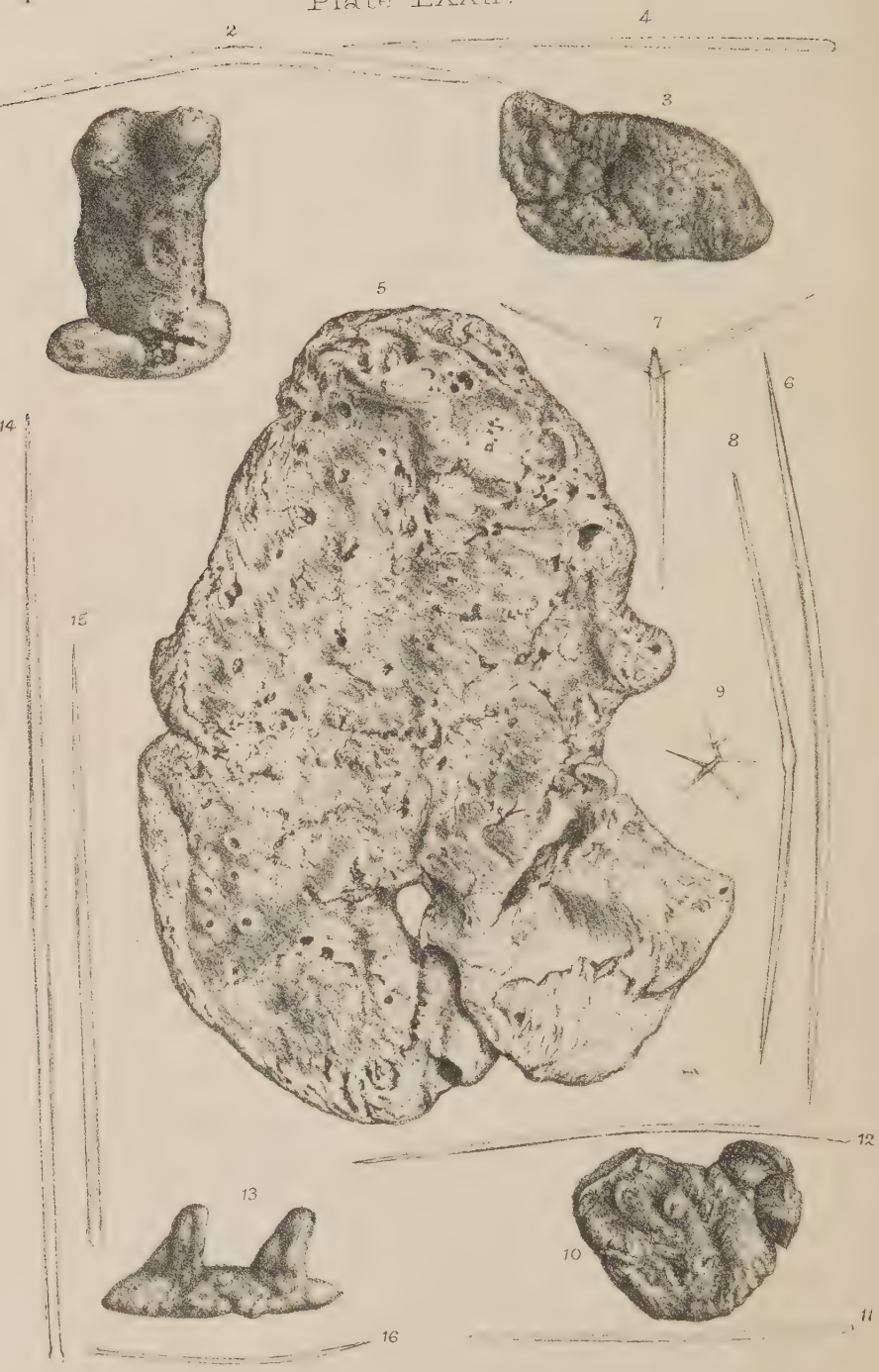
I have unfortunately mislaid the type-specimen of this species described in vol. ii, p. 350, 'Mon. Brit. Sponges,' but a figure of it is, in truth, but of little consequence in regard to its future recognition, as its structural peculiarities are so strongly marked as to render its discrimination an easy task.

A re-examination of some minute fragments of it has produced two forms of retentive spicula that I had not seen in the previously examined portions of the specimen. I found in one mounting of the spicula seven specimens of the small dentato-palmate inequi-anchorate form represented by fig. 7, Plate LXXI, all agreeing in size and proportions; two of the large description of dentato-palmate inequi-anchorate ones represented by fig. 8, and one large bidentate inequi-anchorate spiculum represented by fig. 9.

I have no doubt that both these forms will be found in much larger quantities in future specimens of this sponge in a better state of preservation.

The presence of these forms of retentive spicula should therefore be added to the specific description of the species in vol. ii, p. 350 of 'Mon. Brit. Spongiadæ.'

Plate LXXII.



Hymeniacidon firmus 1-2. H. radiosa 3-4. H. placentula 5-9.
H. plumiger 10-12. Polymastia conigera 13-16.

W West & C° imp.

W Lens Aldous del. et lith.

PLATE LXXII.

Hymeniacidon firmus, *Bowerbank.*

Fig. 1. — Represents the type-specimen, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 2.—One of the skeleton spicula. × 250 linear.

Hymeniacidon radiosa, *Bowerbank.*

Fig. 3.—Represents the type-specimen, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 4. — An average-sized skeleton spiculum. × 250 linear.

Hymeniacidon placentula, *Bowerbank.*

Fig. 5.—Represents the type-specimen of the species. Natural size.

Fig. 6.—A skeleton spiculum. × 80 linear. This figure also represents the large acerate tension spicula of the dermis.

Fig. 7.—A large equi-angulated spiculated triradiate spiculum from the dermis. × 123 linear.

Fig. 8.—One of the inflato-acerate, incipiently tuberculated tension spicula of the dermal membrane. × 530 linear.

Fig. 9. — An attenuato-elongo-stellate retentive spiculum from the dermal membrane. × 530 linear.

Hymeniacidon plumiger, *Bowerbank.*

Fig. 10.—Represents the type-specimen, in the cabinet of Mr. W. Saville Kent. Natural size.

Fig. 11.—One of the spicula from the dermal featherly fasciculi. × 250 linear.

Fig. 12. — An average-sized skeleton spiculum. × 250 linear.

Polymastia conigera, *Bowerbank.*

Fig. 13.—Represents the type-specimen, in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 14.—One of the large external basal defensive spicula. × 123 linear. This figure also represents the skeleton spicula of the basal mass and the fasciculi of the cloacæ.

Fig. 15.—One of the smaller skeleton spicula from between the primary skeleton fasciculi of the basal mass. × 123 linear.

Fig. 16.—One of the secondary defensive spicula from the surface of the cloacæ. × 250 linear.

Hymeniacidon firmus, *Bowerbank.*

Plate LXXII.

Sponge massive, parasitical, firm and fleshy. Surface smooth and even. Oscula simple, dispersed few in number. Pores inconspicuous. Dermis strong and tough, abundantly spiculous; spicula acerate, stout, strong and very thickly felted together, with porous areas sparingly dispersed amid the felted spicula, which are the same in size as those of the skeleton; dermal membrane translucent. Skeleton.—Abundantly spiculous, closely and compactly constructed in all its parts; spicula acerate, all stout and strong, closely and irregularly disposed. Interstitial membranes translucent. Sarcode very abundant.

Colour.—In spirit, dull ochreous yellow.

Habitat.—Jersey; Rev. A. M. Norman.
Examined—From spirit.

I have seen only one specimen of this species. It was dredged at Jersey in 1867 by the Rev. A. M. Norman. It is parasitical on a slender fucus which it envelopes entirely. It is two and a quarter inches in length, ten lines in breadth, and its greatest thickness is seven lines. The surface is smooth, and the mass of the sponge very firm and fleshy. There are several oscula on each of the broad surfaces of the sponge, none of them exceed a line in diameter.

The spicula in the dermis are so abundant and so closely felted together as to render their form *in sitú* undistinguishable. In some parts of the dermis the porous areas are tolerably numerous, while in other parts there are few, and the intervening spaces are considerable.

In the skeleton the same profusion of spicula that so strongly characterises the dermis is observable; they cross each other in every possible direction, and from their stoutness and great number they render the sponge almost as firm and solid as either *H. suberea*, *ficus*, or *carnosa*. This strength and solidity of character renders this species readily distinguishable from any of the other British species among their congeners in the first section of the genus *Hymeniacidon*.

In many species of *Hymeniacidon*, although the whole of the spicula are of the same form a great number of them are much more slender than the others, and represent the tension spicula on the interstitial membranes in other sponges, but this is not the case in the species in course of description, in which the whole of them are of the same degree of length and stoutness.

Hymeniacidon radiosa, *Bowerbank.*

Plate LXXII.

Sponge massive, sessile, firm and fleshy, surface

smooth and even. Oscula simple and dispersed, few in number. Pores inconspicuous. Dermal membrane tough and strong, spiculous; spicula very abundant, irregularly and thickly felted together, acuate, same size and form as those of the skeleton. Skeleton.—Radiating confusedly towards the dermal surface in very loosely compacted fasciculi; spicula acuate, very abundant.

Colour.—In spirit, pale ochreous yellow, with a shade of green.

Habitat.—Jersey; Rev. A. M. Norman.

Examined.—From spirit.

The specimen described is the only one I have yet seen. It is one and three quarters inch broad, one inch high, and half an inch thick at its base, whence it becomes gradually thinner, until at the distal margin it does not exceed one eighth in thickness. Both the broad surfaces are slightly undulating with a few shallow depressions. The oscula are small, very few exceeding half a line in diameter. The dermal membrane is remarkably abundant in spicula, and they are closely felted over each other in every direction. The most striking specific character is in the singular arrangement of the skeleton tissues which present a compact radiating structure throughout the whole of its substance; the like of which I have never observed in any other species belonging to the same section of the genus *Hymeniacidon;* but in the following section of the genus with spinulate spicula this radiating mode of the spicula arrangement may be observed in *H. suberea* and *carnosa*, to a certain extent beneath the dermal surfaces, while in the deeper seated parts of the sponges the usual forms of the characteristic structures of the genus may be observed. The size and form of the skeleton spicula are so like those of several other nearly allied species that they are of very little use in discriminating the species.

Hymeniacidon placentula, *Bowerbank.*

Plate LXXII.

Sponge compressed, flat, sessile. Surface smooth. Oscula simple, depressed. Pores inconspicuous. Dermis smooth, abundantly spiculous; tension spicula large, acerate, same as those of the skeleton, and large equi-angulated attenuato-triradiate, radii frequently distorted, few in number; also sub-inflato acerate, incipiently-tuberculated, dispersed, minute, and very numerous. Retentive spicula, attenuato-elongo-stellate, very minute and numerous. Skeleton diffused, spicula sub-fasciculated, acerate, rarely acuate, large and long. Interstitial membranes pellucid; tension spicula sub-inflato-acerate, incipiently-tuberculated, very numerous. Retentive spicula attenuato-elongo-stellate, very minute and numerous.

Colour.—In the dried state, cream white.

Habitat.—The Hebrides, J. G. Jeffreys, Esq.

Examined.—In the dried state.

I am indebted to my friend Mr. J. G. Jeffreys for two specimens of this sponge. They are in form like an irregularly made biscuit-cake; each of them from three to five lines in thickness; one of them is four and a half inches long by three in breadth, and the other, two inches long by one and a quarter broad. The edges are more or less thick and obtuse. I could not detect a basal attachment on either of them. The oscula on the larger specimen are abundant on one of the two broad surfaces, while very few are apparent on the other one; they are numerous and very equally dispersed, and vary from half a line to about a line in diameter. On some parts of the same surface the pores are visible by the aid of a lens of two inches focus. The dermal membrane is thin and very pellucid and is crowded with its various spicula. A few, comparatively, of the large skeleton spicula are embedded on its under sur-

face, and the large attenuato-triradiate spicula are also few in number. They are remarkable for the frequent contortions of their radii; a few of them are spiculated, the spicular ray most frequently passing outward. The inflato-acerate spicula are by far the most abundant of the tension ones, and in some parts they are thickly felted together, especially around the areas of the pores. These spicula are singular in their structure, and are very characteristic of the species. They are very variable in their characters; the central inflation is well produced in some, while in others it is scarcely visible or entirely absent; the incipient tuberculation is also variable; in many of them, it has the appearance of hemispherical nodules, while in others it is so slightly produced as to assume the form of a very early stage of incipient spination, and in all of them it is more or less apparent on every part of the spiculum when viewed with a power of about 800 linear. The attenuato-elongate stellate retentive spicula are also abundantly dispersed on all the membranes, and especially so on the inner surface of the dermal one. They are minute, variable in size, and very irregular in form, requiring a power of about 800 linear to demonstrate them in a satisfactory manner.

The structure of the skeleton is open and diffused, and occasionally a few of the spicula are fasciculated, but these fasciculi are not continuous for more than twice or thrice the length of a spiculum. The tension and retentive spicula of the interstitial membranes are not quite so abundant as in the dermal membrane. The interstitial membranes are so thin and pellucid that they would scarcely be visible if it were not for the numerous spicula they contain.

The colour and general aspect of the sponge in its dried condition is so like many flat and imperfect specimens of *Phakellia ventilabrum* that it might readily be mistaken for one of that species when mixed with them.

Hymeniacidon plumiger, *Bowerbank.*

Plate LXXII.

Sponge sessile, coating. Surface even, smooth, or slightly corrugated. Oscula slightly elevated and conical; margins thin, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; spicula disposed in flat featherly elongated bundles, curving irregularly; spicula of the fasciculi numerous, acuate, *not* quite so long as those of the skeleton. Skeleton abundantly spiculous; spicula acuate, long, and rather slender, very variable in diameter.

Colour.—In spirit dark olive-green.

Habitat.—Off Guernsey; Mr. W. Saville Kent.

Examined.—From spirit, in the condition in which it came from the sea.

I am indebted to Mr. W. Saville Kent for my knowledge of this sponge, which he obtained while dredging off the Island of Guernsey in the yatch Norma in the summer of 1870. The dimensions of the specimen are one and a quarter inch in length, an inch in breadth, and three lines in thickness. The oscula are about ten in number, and nearly at equal distances from each other; they are slightly conical, and their margins are very thin and somewhat irregular.

The dermis of this sponge affords the most valuable distinctive characters. The dermal membrane is thin and translucent. It is abundantly furnished with numerous, slightly-curving, fasciculi of continuous series of spicula; from the surfaces of the bundles, spicula are projected at slight angles towards their distal extremities, where they radiate more or less in a fan-shaped manner, giving to the flat fasciculi an appearance very like that of a small wet feather.

The skeleton is abundantly spiculous. The spicula are regularly acuate, of the same form as those of the dermis, but longer in their proportions, and, although nearly all of equal length, they vary to a considerable

extent in their diameter, some of them being of extreme tenuity. The spicula of this species and those of *H. consimilis* and *H. perlevis* are nearly of the same form and proportions; but in the former of the two species not only is the external form of the sponge distinctly different, but in the dermal membrane, although abundantly spiculous, they are irregularly dispersed instead of being arranged in fasciculi, and in *H. perlevis* the dermal membrane is aspiculous.

I subsequently found a second specimen of this species among the sponges dredged off Guernsey by Mr. Kent. It was about the same size as the type-specimen, and very closely resembled it in all its external and internal characters, with this difference only, that in a piece of the dermal membrane examined one portion of it very closely resembled that of the type-specimen, while immediately adjoining that spot the fasciculi assumed a reticulated character; and in another part of the same piece they were indiscriminately felted together. As a precaution to naturalists who attach value to external characters I may mention that the two specimens of this species were mixed with several others of *Hymeniacidon reticulatus*, and that the two species were so much alike in external characters that I could not separate them without microscopical examinations.

Polymastia conigera, *Bowerbank.*

Plate LXXII.

Sponge sessile, coating. Surface strongly hispid. Oscula terminal, inconspicuous, congregated on short, stout, smooth, conical, cloacal fistulæ; apices of the fistulæ obtuse; dermis coriaceous, armed profusely with densely packed, minute fusiformi-spinulate spicula. Pores inconspicuous. Skeleton of cloacal fistulæ. Fasciculi polyspiculous, large, and numerous; spicula super-fusiformi spinulate, basal portions frequently

bi- or tri-spinulate. Skeleton of basal mass. Fasciculi polyspiculous, irregularly disposed; spicula same as those of the cloacal fistulæ. Primary external defensive system. Spicula as large and as long, and of the same form as those of the skeleton; projected beyond the dermal surface for the greater portion of their length; very numerous; secondary defensive system the same as that of the surface of the cloacæ. Interstitial membranes. Tension spicula, minute fusiformi-spinulate.

Colour.—In spirit, light fawn-yellow.

Habitat.—Shetland; forty to fifty fathoms; Rev. A. M. Norman.

Examined.—In the wet state from spirit.

The specimen under consideration is fifteen lines in length, five lines in breadth, and rather exceeding two lines in thickness, but I do not believe this to be its natural dimensions but rather that it is a portion of a larger specimen, as what there remains of it has all the characters of a fully-developed sponge, and there are no indications of basal membrane to lead us to a correct knowledge of its thickness. It is furnished with two, large, well-developed, cloacal fistulæ, of nearly equal size; the largest of them is five lines in height and four lines in breadth at the junction with the basal mass; each of them is compressed so that their thickness from back to front at the base does not exceed two lines.

The strikingly hirsute character of the basal mass contrasted with the smooth and even surfaces of the cloacal fistulæ readily leads to the discrimination of this sponge; the spicula are very numerous, aud many of them exceed the sixteenth of an inch in length, so that the strikingly smooth mammæform fistulæ even to the unassisted eye appear to spring as it were out of a basal bed of large long spines. When a section of the sponge at right angles to its surface is examined in Canada balsam with a power of one hundred linear the secondary system of external defensive spicula are

seen to be also very numerous, and their apices are scarcely projected beyond the dermal surface; but this is not the case when they appear as the sole defensive organs of the fistulæ. They are then projected through the dermal membrane for the greater portion of their length, and are extremely numerous, and are closely packed together in such a manner as to resemble wet fur on the skin of an animal membrane, lying in patches without any definite direction.

The mammæform fistulæ rise from a well-defined ring; up to the outer margin of which they are surrounded by the dense crop of large external spicula, which are of the same form and size as those of the skeleton fasciculi of the basal ring, whence they spring. Within this basal ring not a single large spiculum is seen to be projected from the base of the spicula, which to the unassisted eye appears as strikingly smooth as all without the circle appears abundantly and coarsely hispid. This remarkable structural character serves admirably to distinguish this species from its closely allied congeners.

The fasciculi of the skeleton in the basal mass are irregularly dispersed; they are rather loosely constructed, and their distal terminations radiate slightly as they approach the dermis, through which they are projected, thus forming the abundant hispidation of the basal dermal surface.

The skeleton fasciculi of the cloacal fistulæ are large and numerous, the interspaces between them being not more than about half the width of one of the bundles.

The spicula, of which all the parts of the skeleton are formed, are large and long; the shaft of the spiculum is strikingly fusiform, but the spinulation is by no means strongly produced. Their most remarkable character is, that the greater portion of them are bi- or tri-spinulate, and in some cases the spinulate inflations on the basal portion of the shaft are as many as four or five at nearly equal distances from each other.

There are but two among the known species of British Polymastia with which the species under consideration is liable to be confounded by a hasty observer, and these are *P. robusta* and *P. mammillaris*. The short conical fistulæ and the abundant hispidation of its basal surface, contrasted with the smooth basal mass and the elongate fistulæ of the first-named species of the two will readily distinguish them, independant of the more decisive character arising from the difference in form of their respective skeleton spicula. It may also be readily separated from *P. mammillaris* by the difference in the forms of their skeleton spicula and the smoothness of the basal surface of the last-named species.

Since the above description was written I have received two more specimens of the species from Mr. Norman. One is rather less than that which is figured. It has two conical fistulæ, but one of them is very much smaller than the other, but the general resemblance is very close to that of the type-specimen. The other specimen is about half the size of the figured one, and it has but one conical fistula, but is a complete and perfect specimen.

Plate LXXIII.

Halichondria foliata 1-5. H. edusa 6-9. H. regularis 10-11.
H. Couchii. 12-15. Microciona simplicima 16-19.

W. Lens Aldous del et lith.

W West & Co imp.

PLATE LXXIII.

Halichondria foliata, *Bowerbank.*

Fig. 1.—Represents the finest and best-developed specimen from Shetland in the condition in which it came from the sea. Natural size.

Fig. 2.—Is from a small, but well-developed specimen from Scarborough in the dried state. Natural size.

Fig. 3.—One of the slender, acuate, tension spicula from the dermal membrane. × 250 linear.

Fig. 4.—A skeleton spiculum. × 250 linear.

Fig. 5.—One of the tricurvate-acerate, tension spicula from the interstitial membranes. × 250 linear.

Halichondria edusa, *Bowerbank.*

Fig. 6.—Represents the type-specimen of the species in the wet condition. In the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 7.—A small portion of the dense polyspiculous, dermal reticulation. × 180 linear.

Fig. 8.—An acerate skeleton spiculum. × 250 linear.

Fig. 9.—A tension spiculum from the interstitial membranes. × 250 linear.

Halichondria regularis, *Bowerbank.*

Fig. 10.—Represents the type-specimen from Sark. Natural size.

Fig. 11.—One of the skeleton spicula. × 250 linear.

HALICHONDRIA COUCHII, *Bowerbank.*

Fig. 12.—Represents the type-specimen from Mr. Jonathan Couch. Natural size.

Fig. 13.—A skeleton spiculum. × 250 linear.

Fig. 14.—One of the minute, slender, acerate, tension spicula from the dermal membrane. × 250 linear.

Fig. 15.—One of the contort, bihamate, retentive spicula from the dermal membrane. × 530 linear.

MICROCIONA SIMPLICIMA.

Fig. 16.—Represents the type-specimen of the species in the cabinet of Rev. A. M. Norman. Natural size.

Fig. 17.—One of the skeleton columns. × 60 linear.

Fig. 18.—A skeleton spiculum. × 123 linear.

Fig. 19.—One of the long, flexuous, cylindrical, spicula of the dermal membrane. × 123 linear.

HALICHONDRIA FOLIATA, *Bowerbank.*

Plate LXXIII.

Sponge branching, branches thin and leaf-like, expanding in the same plane. Surface even, coarsely reticulated, minutely hispid. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane thin, pellucid, spiculous; tension spicula acuate, long, and very slender, dispersed; retentive spicula dentato-palmate equi-anchorate, and bidentate equi-anchorate, very minute, rather numerous, dispersed. Skeleton.—Rete very large and irregular, multispiculous; spicula flecto-acuate, large, and stout, but short in their proportions. Internal and external defensive spicula, same as those of the skeleton. Interstitial membranes thin and pellucid, tension and retentive spicula same as those

of the dermal membrane and also, tricurvato-acerate ones, long, slender, and abruptly looped in the middle; terminal curves nearly obsolete, nearly straight.

Colour.—Olive-green in the wet state, brown when dried.

Habitat.—Haaf Banks, Shetland; seventy fathoms; Mr. Humphreys, Scarborough; Mr. Peter, Cullen.

Examined.—In the wet condition.

I received two specimens of this sponge from the Shetland fishermen through their agent Mr. Humphreys. The largest specimen is seven and a quarter inches high, but very narrow and unshapely in its form. The basal portion of the sponge is very little larger than the distal one. It is rather stout, but irregular in its shape, but as the stem progresses upward, it gradually becomes compressed; the distal portions expand laterally, and assume a thin and leaf-like form. The whole of the branches are in nearly the same plane.

I have also received specimens of this species from Scarborough, said to have been brought up by the fishermen or trawlers on the Dogger Bank. They vary in size and form considerably from the figured specimens. One of them is seven inches in height, branching very irregularly, but terminating in three fan-like flat branches, approaching somewhat in form to the smallest of the two-figured specimens. Others of them were smaller, but all possessed more or less of the general external characters.

The reticulations of the skeleton are large and coarse, and the fibre in some parts is constructed of more spicula than can be readily counted, while in other parts it consists of but one or two spicula cemented together. The dermal membrane in all the specimens has been nearly entirely destroyed, a few minute patches of it only remaining, but on these small portions the spicula peculiar to it are in a good state of preservation. In consequence of the very general absence of the dermal tissue the nature of the oscula cannot be

determined with precision, but there is every appearance that they have been small and simple in their structure. The skeleton structure in the interior of the sponge is quite as large and coarse as it is at the surface. The spicula forming the fibre are large and stout, and nearly all are more or less flecto-acerate. The areas of the network of the skeleton are large and irregular in form, and single skeleton spicula are frequently projected into their spaces as internal defensive spicula, at right angles to the fibres forming their parieties. The external defensive spicula are also projected from the surface-fibres in like manner, and the minute hispidation of the surface is not visible to the unassisted eye, but in sections at right angles to the dermis when mounted in Canada balsam they are very distinctly demonstrated. The interstitial membranes are very delicate in their structure. They are abundantly supplied with the same forms of spicula that are found in the dermal membrane. The delicately slender tension spicula are not so numerous as the anchorate ones. The latter forms are especially characteristic of the species; they are exceedingly minute, being barely visible when separated from the sarcode by boiling in nitric acid, by a linear power of 200, but to define them in a satisfactory manner they require a power of about 700 linear. Although so minute, they are fully and completely developed. A large-sized palmato-anchorate one measured $\frac{1}{1400}$ inch in length, and one of the bidentate equianchorate ones $\frac{1}{1628}$ inch in length. Their length very slightly exceeding the diameter of a skeleton spiculum, the latter being $\frac{1}{1750}$ inch.

The tricurvato-acerate, tension spicula are also very characteristic of the species; they are very long and slender, and are not readily to be detected amid the tissues. The angular flexure in the middle of the shaft varies considerably in its form, and occasionally it assumes that of a loop. The shaft from the middle to either extremity is usually very nearly straight.

HALICONDRIA EDUSA, *Bowerbank.*

Plate LXXIII.

Sponge massive, parasitical on fuci. Surface tuberculated, smooth. Oscula simple, small, and few in number. Pores inconspicuous. Dermal membrane strong and tough; furnished with a dense polyspiculous rete, each area containing a single pore, or, in parts with a densely-felted layer of spicula, apparently without pores. Skeleton irregular, rather dense; spicula sub-fusiformi acerate, somewhat variable in length, rather stout. Interstitial membranes, tension spicula few in number, slightly less, and more slender than those of the skeleton.

Colour.—Dark fawn-yellow in spirit.

Habitat.—Jersey; Rev. A. M. Norman.

Examined.—From spirit.

I received this specimen for examination from the Rev. A. M. Norman; it has been preserved in spirit in the state in which it was taken from the sea. It is a small, rudely pear-shaped mass, parasitical on the slender stem of a fucus. It is ten lines in length and seven at its greatest diameter. The surface is smooth, but strongly tuberculated, and so tough that it was with difficulty that I could get clean sections with a sharp knife from out of the back part of the sponge for examination. The oscula are small and few in number, and are scarcely to be seen without the aid of a two-inch lens. The most striking specific character is in the dermal structure, but it is visible only when mounted in Canada balsam, the quantity and density of the sarcode when viewed in its natural condition entirely obscuring its anatomical characters. When a section from the dermal surface was mounted in balsam and viewed with a microscopical power of 108 linear, the strikingly characteristic nature of the dermal tissues were beautifully displayed. The greater portion of the surface was covered by a dense reticulation,

the rete, composed of numerous spicula, being broad and flat, occupying as much space as the enclosed porous areas. This reticulation obtains over the greater part of the surface, but occasionally there are small patches where the network and its areas are entirely covered over by a dense felting together of spicula of the same size and proportions as those of the rete and of the skeleton. The structures of the dermal surface when thus rendered distinctly visible by immersion in Canada balsam are strikingly characteristic of the species; but in almost every other anatomical character of the sponge it might be readily mistaken for *Halichondria caduca*. The structure of the skeleton very closely resembles that of the last-named species, but on a close comparison it appears to be rather more dense and more abundant in spicula. The skeleton spicula of the two species also agree very closely together, in both form and size, and the only difference seems to be that those of *H. edusa* are in a slight degree more fusiform than those of *H. caduca*.

Halichondria regularis, *Bowerbank*.

Plate LXXIII.

Sponge massive, sessile. Surface smooth and even. Oscula simple, dispersed, Pores minute, congregated. Dermal membrane aspiculous, translucent. Skeleton. —Rete very regular and uniform in its structure; areas triangular or quadrangular — unispiculous or bispiculous—rarely exceeding the width of one spiculum; spicula acerate short and stout, uniform in size.

Colour.—In the dried state, milk white.

Habitat.—Sark; Mrs. Collings.

Examined.—In the dried state.

I received this interesting little specimen from my indefatigable friend Mrs. Collings, the lady of the Seigneur of Sark. It is an inch in length, nine lines in breadth, and not quite three lines in thickness.

The under surface is traversed by a straight thin stem of, apparently, a zoophyte, so that in its living state it was probably parasitical. The surface on which this stem is situated is nearly flat, and it does not present any very striking characters. The opposite surface which has apparently been the upper one, is slightly rounded, the thickest portion being near the middle. This surface presents the most striking characters. When examined by direct light with a power of fifty linear we observe a number of rather indistinctly defined areas, in each of which are numerous minute pores closely congregated. These little areas are not amenable to an ordinary hand-lens, but by the aid of the power I have named above, they afford prominent and very distinct specific characters. The general structural peculiarities of the skeleton are strikingly different from any others that I have described in the division of the species of Halichondria to which it belongs. The reticular structure of its skeleton is much more regular, and the component spicula are very much smaller than those of any of the nearly allied species, and at the first glance at its anatomy it has, from the regularities of its structure and the smallness of its spicula, very much of the general aspect of an Isodictya; but on a closer investigation we fail in detecting the slightest indication of the radial structure of the skeletons of the sponges belonging to that genus. The spicula are purely acerate in form, and are but very slightly curved; an average sized one measured $\frac{1}{176}$ inch in length and $\frac{1}{3000}$ inch at its greatest diameter.

Halichondria Couchii, *Bowerbank.*

Plate LXXIII.

Sponge massive, compressed, sessile. Surface even, smooth. Oscula simple, dispersed, minute. Pores inconspicuous; dermal membrane pellucid, reticulated; spicula of the rete same as those of the skeleton;

tension spicula acerate, minute, and very slender, few in number; retentive spicula simple and contort, bihamate, minute and slender, not very numerous. Skeleton.—Reticulations regular and distinct, rete rarely more than unispiculous; spicula acerate, rather stout. Interstitial membranes pellucid, spiculous; tension and retentive spicula same as those of the dermal membrane, few in number.

Colour.—Dried, light gray.

Habitat.—Coast of Cornwall; Mr. Jonathan Couch.

Examined.—In the dried state.

I am indebted to Mr. Jonathan Couch for my knowledge of this species. The specimen is half an inch in height, three lines in breadth, and about half a line in thickness, and is of an elongo-ovate shape, the basal extremity being the largest end. The oscula are very small and scarcely visible without the aid of a lens of about half an inch focus.

The reticulations of the dermal membrane are coincident with those of the skeleton beneath. The tension and retentive spicula are very few in number and so minute as to require a power of 400 linear to define them accurately. The structural characters of this species, as regards the skeleton, are very similar to those of the corresponding parts of *Halichondria angulata*, but the spicula of the latter are longer in the proportion of about three to two than those of the former, and they are also more slender in their proportions; but on a minute examination the presence of the bihamate spicula and the total absence of the subangulated tricurvate acerate tension spicula of *H. angulata* readily separate the two species.

Microciona simplicima, *Bowerbank*,

Plate LXXIII.

Sponge coating, surface irregular. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane

pellucid, spiculous; spicula cylindrical, long, slender, and very flexuous; rarely acerate, irregularly dispersed, numerous. Basal membrane stout, abundantly spiculous; spicula like those of the dermal membrane, very numerous, and closely matted together. Skeleton.—Columns short and stout; spicula acuate, not more than half the length of those of the dermal and basal membranes, but rather stouter.

Colour.—Milk white in the dried state.

Habitat.—Shetland, 96 fathoms; Rev. A. M. Norman.

Examined.—In the dried state.

This specimen was dredged at Shetland in 1867. It is a nearly circular flat patch of sponge five lines in diameter, and its greatest thickness is about a line and half. It has apparently been scraped off a stone or an old shell. The surface is very uneven and rugged, apparently from the shrinking inward of the dermal tissues, so that the distal extremities of the skeleton columns are projected in the form of miniature hillocks.

The most remarkable character in this species is the simplicity of its organization. The columnar structure of the skeleton is very indistinctly produced. The spicula of which it is composed are all acuate or subattenuato-acuate, their divergence from the column is at a very slight angle until they attain the surface where they spread out and form an irregular plain of support to the dermal membrane and its spicula. The spicula of the dermal membrane are few in number as compared with those of the basal one. They are alike in every respect in the two membranes, and are at least twice as long as those of the skeleton, and are rather less in their diameter. In the basal membrane they are very numerous, and are closely felted together. A very few comparatively short acerate spicula are occasionally found among them. No internal defensive or retentive spicula could be detected in any part of the sponge.

Plate LXXIV.

Halichondria falcula 1–3. H. mutula 4–8. H. expansa 9–13.
H. ambigua 14–15. Hymeniacidon tegetecula 16–17.

W. Lens Aldous del et lith. W. West & Co imp.

PLATE LXXIV.

Halichondria falcula.

Fig. 1.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 2.—A skeleton spiculum. × 250 linear.

Fig. 3.—One of the trenchant, contort, bihamate, retentive spicula. × 250 linear.

Halichondria mutula, *Bowerbank.*

Fig 4.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural zize.

Fig. 5.—A skeleton spiculum. × 123 linear.

Fig. 6.—One of the slender, acuate, tension spicula × 123 linear.

Fig. 7. — A tricurvato-acerate tension spiculum. × 123 linear.

Fig. 8.—One of the minute, dentato-palmate, equi-anchorate, retentive spicula. × 530 linear.

Halichondria expansa, *Bowerbank.*

Fig. 9.—Represents the type-specimen from the Isle of Skye. In the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 10. — One of the long, slender, incipiently-spinous, tension spicula of the dermal membrane. × 250 linear.

Fig. 11. — A skeleton spiculum, entirely and incipiently spinous. × 250 linear.

Fig. 12.—One of the bi-dentate, inequi-anchorate

retentive spicula from the dermal membrane. × 530 linear.

Fig. 13.—A dentato-palmate, inequi-anchorate spiculum from the dermal membrane. ×530 linear.

Halichondria ambigua, *Bowerbank.*

Fig. 14.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 15.—One of the acerate skeleton spicula. × 123 linear.

Hymeniacidon tegetecula, *Bowerbank.*

Fig. 16. — Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 17.—One of the skeleton spicula. × 250 linear.

Halichondria falcula, *Bowerbank.*

Plate LXXIV.

Sponge massive, sessile; surface uneven, minutely spinous and reticulated. Oscula simple, dispersed. Pores inconspicuous; dermal membrane pellucid, furnished with a stout, irregular, polyspiculous network: pores dispersed amidst the areas. Skeleton.—Rete polyspiculous, very irregular and diffused; spicula fusiformi-acuate, slender and long. Interstitial membranes. Tension spicula same as those of the skeleton, but smaller, few in number. Retentive spicula, trenchant contort bihamate, stout and large, very few in number. Gemmules membranous, aspiculous.

Colour.—In the dried state, cream white.

Habitat.—Shetland; Rev. A. M. Norman.

Examined.—In the dried state.

The general appearance of this sponge is much like

that of the nodulous amorphous specimens of *Halichondria panicea*, when it is parasitical on slender branching fuci and it may readily be mistaken for that species; and especially if we view its surface by the aid of a two-inch lens, when it presents to the eye very much the same minute reticulation that is so characteristic in *H. panicea*. A section at right angles to the surface from the dried specimen exhibits a slight degree of hispidation arising from the protrusion of the terminations of some of the fasciculi of the skeleton through the dermal membrane, but it is very probable that that character would not be perceptible in a living specimen. The difference in the forms of the spicula at once separates the two species.

The rete of the dermal membrane is very like that of *Hal. panicea*, but the network appears to contain a greater number of spicula of the same size and form as those of the skeleton. In the specimen in course of description the pores were abundant, and in an open condition.

The trenchant contort bihamate retentive spicula, are among the most remarkable of the specific characters of this sponge. They are usually attached at the back of one of the hooks to the rete of the skeleton structure, while the other end is projected into its interstices. The cutting edges of the trenchant parts of the spiculum appear to be exceedingly sharp. They very closely resemble those of *Hymedesmia Johnsoni* represented in Plate v, fig. 112, vol. i, 'Monograph of British Sponges,' both in size and form. They are exceedingly few in number, and may easily escape the notice of a hasty observer, and they are most readily detected in a preparation of the spicula by boiling in nitric acid.

Halichondria mutula, *Bowerbank*.

Plate LXXIV.

Sponge sessile, massive. Surface openly reticulated.

Oscula simple, very numerous. Pores inconspicuous. Dermal membrane spiculous; tension spicula acuate, slender, very nearly as long as those of the skeleton, few in number; also tricurvato-acerate, very long and slender, nearly straight, sometimes flexuous; central curve abruptly angulated or looped, rather numerous; retentive spicula dentato-palmate, equianchorate, very minute and symmetrical, few in number. Skeleton, equably reticulate; rete stout and polyspiculous; spicula sub-attenuato acerate, stout and strong, moderately long. Interstitial membranes pellucid; furnished with the same forms of spicula as the dermal membrane, but more sparingly.

Colour.—In the dried state, light brown.

Habitat.—Shetland, ninety-six fathoms. Rev. A. M. Norman.

Examined.—In the dried state.

I received two small pieces of this sponge from Mr. Norman. The largest was two inches in length, and at the thickest end slightly exceeded half an inch in average diameter. The smaller piece was not quite an inch in length, and of about the same diameter as the larger one; both of them appear as if they had been scraped off from a large shell or stone, and probably had formed parts of the same sponge.

The surface is strikingly characteristic. It has the appearance of an irregular and very open network, the areas of which are many of them nearly a line in diameter.

These areas have every appearance of being the oscular orifices of the sponge, no other such organs being apparent. The rete of this open network of skeleton tissue is formed of the ordinary reticulate skeleton of the sponge, covered by a delicate transparent dermal membrane, containing the appropriate spicula of that organ; and these spicula are also strikingly characteristic of the species. The slender acuate tension spicula are often two thirds or three fourths of the

length of the skeleton ones, but their diameters are not more than one seventh or one eighth of those of the skeleton. The most characteristic of these spicula is the tricurvato-acerate form. They are normally long and nearly straight, but they are frequently more or less flexuous or distorted; the middle curve is mostly short and angular, like that of the printer's bracket used to equalise two or more names. Sometimes the limbs of the middle angle are so distorted as to assume the form of a round or oval loop. These spicula are very slender, but they are often twice the length of a skeleton spiculum. They occur in considerable numbers in the dermal membranes, and are most frequently grouped in loosely constructed fasciculi.

The retentive spicula are beautiful, but very minute objects; they are rather long, with two equal sized well developed and very symmetrical palms. They are so small as to require a power of five or six hundred linear to demonstrate their forms correctly. They are dispersed rather sparingly on the membranes, and are not readily detected *in sitú*.

The comparative measurements of these spicula afford some very characteristic points for the discrimination of the species. Thus, the diameter of an adult skeleton spiculum is $\frac{1}{1363}$ inch; and this measurement is exactly that of the length of a full sized palmato-anchorate retentive spiculum. The tricurvato-acerate tension spicula are frequently nearly twice the length of a skeleton spiculum, but while the latter has a diameter of $\frac{1}{1363}$ inch, that of the former does not exceed the $\frac{1}{15000}$ inch, or about $\frac{1}{11}$ part of the stouter form.

The interstitial membranes were abundantly supplied with the dark amber-coloured sarcode of the sponge; but a close examination of them, aided by a strong light displayed a sparing distribution on their surfaces of each of the forms of spicula that have been described as appertaining to the dermal membrane.

Halichondria expansa, *Bowerbank.*

Plate LXXIV.

Sponge compressed, expanding laterally; parasitical. Surface smooth and even. Oscula simple, minute, dispersed. Pores inconspicuous. Dermis furnished with a stout, irregular network; rete composed of broad, flat, polyspiculous fasciculi; spicula fusiformi-cylindrical; terminations incipiently spinous, spines very minute; tension spicula acerate, long and slender, frequently flexuous; basal terminations incipiently spinous, few in number; retentive spicula bidentate inequi-anchorate and dentato-palmate inequi-anchorate, minute, and few in number. Skeleton rather compact; rete variable, containing from one or two to five or six spicula. Spicula fusiformi-acuate, rather short and stout, incipiently entirely spinous, base, prominently spinous. Interstitial membranes pellucid; tension and retentive spicula same as those of the dermal membrane, few in number. Gemmules membranous, aspiculous.

Colour.—In the dried state dark brown.

Habitat.—Skye; Rev. A. M. Norman.

Examined.—In the dried state.

The form of this sponge is very like that of a longitudinal section of an hour-glass, with a conical base in addition. It is one inch and three quarters in height, and three quarters of an inch at the two points of greatest expansion, and in no part does it exceed the eighth of an inch in thickness. It is parasitical on the remains of a small sertularia. The oscula are very minute, and they appear to be nearly, if not all, on one of the broad surfaces of the sponge, and the pores appear to occupy the other surface. The two surfaces, therefore, vary considerably in their reticular characters; that of the oscular surface being very much more diffuse and irregular than the porous one. The broad flat rete of the latter one is very character-

istic, so also are the spicula of which it is composed; they are distinctly fusiform but very indistinctly spinous at their terminations, requiring a microscopical power of at least 300 linear to define this character in a satisfactory manner. The tension spicula are frequently quite as long as those of the skeleton, but very slender, and a power of 400 or 500 linear is required to define their basal spination. The skeleton spicula are stouter than those of the dermal rete, but they are frequently less in length; the spination of the base is rather abundant and much more strongly produced than that of the remainder of the spiculum, which is sometimes almost destitute of spines, and in all cases they are in a very incipient state, requiring a power of 300 or 400 linear to render them distinctly visible. The two forms of retentive spicula are also very minute, requiring a power of not less than 400 linear to define their structures correctly; the bidentate inequi-anchorate form is the most numerous of the two, but both of them are, comparatively speaking, of rare occurrence.

The only species with which this sponge is likely to be confounded is *Halichondria nigricans*, but the total absence of bipocillated spicula, and the striking differences in the forms and degrees of spination of the spicula will readily distinguish them.

Halichondria ambigua, *Bowerbank*.

Plate LXXIV.

Sponge parasitical on fuci, firm and fleshy. Surface smooth and even. Oscula simple, large, few in number. Pores inconspicuous. Dermal membrane tough and strong; abundantly spiculous, reticulated; rete polyspiculous; areas square or rhomboidal, occasionally with a superadded stratum of dispersed spicula; spicula acerate, rather long and stout; of the same form and size as those of the skeleton. Skeleton abundantly spiculous; rete irregular or subfascicu-

lated; fasciculi polyspiculous, each forming the sides of several areas; spicula acerate, rather long and stout. Interstitial membranes aspiculous.

Colour.—In spirit, dull ocherous-yellow.

Habitat.—Jersey; Rev. A. M. Norman.

Examined.—From spirit.

I have seen no other specimen of this species than the one under consideration. There are no indications of a basal attachment, but strong evidence that the sponge has entirely enveloped a portion of a branching fucus. It is firm and fleshy to the feel, and the dermal membrane is tough and strong. There are two oscula about a line in diameter on the projecting parts of the sponge, and a few others dispersed on its flat portions of about the same size. The pores are not visible to the unassisted eye, but in portions of the dermal membrane mounted in canada balsam, a few single ones in an open state were seen in the areas of the dermal reticulations.

The dermal system is very characteristic of the species. The rete consists of numerous, more or less, polyspiculous fasciculi, which are disposed in nearly parallel lines, which are crossed at nearly right angles or diagonally by single spicula, or two or three loosely fasciculated. These secondary fasciculi seldom exceed a single spiculum in length, while the primary ones are frequently five, six, or more spicula long. The result of this mode of disposition of the dermal spicula is that a rete with square or rhomboidal areas is produced. In some portions of the dermis this mode of arrangement is clearly and beautifully displayed, while in other parts there are so many dispersed spicula superadded, as to very much confuse the view of the dermal reticulation.

The structure of the skeleton is also very remarkable. Immediately beneath the dermal surface it presents the usual indefinite style of reticulation that prevails to so great an extent in the section of Halichondria to which this species belongs, but in the deeper-

seated portions of the sponge there appears numerous long fasciculi of spicula closely resembling those of the primary ones of the dermal system, and the skeleton reticulations are modified accordingly, assuming a degree of regularity in the deeply-seated parts that is not observable in those immediately beneath the dermal tissues; but the areas of the skeleton do not present the same square or rhomboidal forms that are so strikingly characteristic of the dermal membrane.

The characters which I have thus described are the essential specific ones of the sponge. The spicula are of the same form in all parts of the sponge, and are very similar to those of *H. glabra*, *caduca*, *inconspicua*, *incerta*, and *coalita*. Compared with those of the first-named species they are exactly similar in size and form. In *caduca* and *coalita* the forms are the same as in *H. ambigua*, but the length of the latter is as 6 to 4 in the other two. In *H. inconspicua* and *incerta* they are of the same form, but only half the length of those of *H. ambigua*.

Since the above description was written I have received two other specimens of the species for examination. They were obtained by the Rev. A. M. Norman at Portaferry, Strangford Lough. They vary very much in form from the type-specimen. The largest one covers and closely embraces the stems of a slender fucus, which it binds together for the length of rather more than four inches in the shape of a compressed columnar mass rather exceeding three fourths of an inch at its greatest breadth, and following out the branches of the Fucus in several places in the form of small branches two or three lines in diameter, so that its external characters are widely different to those of the type-specimen. The second specimen is very similar in character to the larger one, but it does not exceed an inch in height. The structural characters agree in every respect with those of the type-specimen. The colour in the dried specimens is dirty white or cream colour.

Hymeniacidon tegetecula, *Bowerbank.*

Plate LXXIV.

Sponge parasitical on fuci, more or less fan or cup-shaped, firm and fleshy; margins thick and round; outer or convex surface smooth and even; inner or concave surface even, but somewhat corrugated. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; spicula acerate, of the same size as those of the skeleton; collected in short flat fasciculi which cross each other at every possible angle so as to present an irregular matted appearance. Skeleton compactly formed; spicula acerate, stout, and moderately long, rather numerous.

Colour.—In spirit, light fawn-yellow; dried, nearly white.

Habitat.—Jersey; Rev. A. Norman.

Examined.—From spirit.

I received several fragments of this sponge from the Rev. A. M. Norman for examination; two of them exactly fitted each other, and were evidently parts of the same sponge; the other fragments were also probably parts of it, but they could not be made to fit any parts of the margin of the specimen formed by the two conjoined pieces represented by fig. 16, Plate LXXIV. The specimen thus reconstructed has a curve about equal to one third of the circumference of a cup, it rather exceeds two inches across, and is an inch and three quarters in height at the junction of the two pieces. From the well-defined approximation to the fragment of a cup-shaped sponge, I should scarcely have imagined it to have been parasitical on a slender soft fucus if it had not been that portions of the plant are protruded through several parts of its surface, and the flat bases of three young plants are just without the dermis of the concave surface of the sponge, the stems being immersed in its substance, and no other evidence of attachment to any solid substance being

visible on any part of the margin of the sponge. The specimen as it is might be readily mistaken for a portion of *Isodictya infundibuliformis* by a casual observer, but its anatomical structure at once separates it from that species.

The most certain and striking specific character is found in its dermal membrane. When a portion of it is mounted in Canada balsam and viewed by transmitted light with a power of about 100 linear, it is seen to be profusely spiculous; but the spicula are not indiscriminately felted together without any approximation to order, but they are collected into short fasciculi, each composed of from two or three to seven or eight spicula parallel to each other. The flat bundles cross each other in an irregular manner at various angles, and numerous single spicula are irregularly dispersed among them, the tissue as a whole having the appearance of a very irregularly made mat of short, flat, bundles of spicula. When viewed in the dried state by the aid of a hand lens, the dermal surface has much the same minutely reticulated appearance that is so well known in dried specimens of *Halichondria panicea*.

The form and size of the dermal spicula and those of the skeleton are exactly the same.

In the dried condition the sponge is firm and strong, and of nearly a white colour.

Plate LXXV

Isodictya laciniosa.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE LXXV.

ISODICTYA LACINIOSA, *Bowerbank.*

Fig. 1.—Represents the type-specimen half the natural size.

Fig. 2.—One of the slender, acuate, tension spicula from the dermal membrane. × 250 linear.

Fig. 3.—A retentive equi-anchorate spiculum from the dermal membrane. × 1000 linear.

Fig. 4.—A skeleton spiculum. × 250 linear.

Fig. 5.—An attenuato-acuate, incipiently, entirely-spined, internal, defensive spiculum. × 250 linear.

ISODICTYA LACINIOSA, *Bowerbank.*

Plate LXXV.

Sponge sessile, fanshaped, thin, Surface uneven, somewhat sinuous, laciniose, minutely hispid. Oscula and pores inconspicuous. Dermal membrane pellucid, spiculous; tension spicula acuate, long, and slender, not very numerous; retentive spicula dentato-palmate, equi-anchorate, palm rather exceeding one third of the length of the spiculum; tooth terminally truncated, numerous, very minute. Skeleton very diffuse and open; primary lines from three to five or six spicula in thickness; secondary lines irregular, mostly uni-spiculous, occasionally containing two or three spicula. Spicula acuate, stout, and large. Internal defensive spicula attenuato-acuate, incipiently spinous, minute, few in number. Interstitial membranes spiculous; tension and retentive spicula same as those of the dermal membrane.

Colour.—In the dried state, light brown.

Habitat.—Shetland; 170 fathoms; J. G. Jeffreys, Esq. and the Rev. A. M. Norman.

Examined.—In the dried state.

This sponge was dredged at Shetland in 1867 by Messrs. J. Gwyn Jeffreys and the Rev. A. M. Norman. It is fanshaped, with a sessile base of about four inches in length. The width of the whole sponge slightly above the base is ten and a half inches, and its greatest height seven and a half inches. The average thickness does not exceed half an inch. The primary fan is nearly in the same plane, but somewhat irregularly sinous, and from about the middle of its concave surface there is a secondary fan given off at nearly right angles to the primary one. In the dried condition the sponge is remarkably fragile.

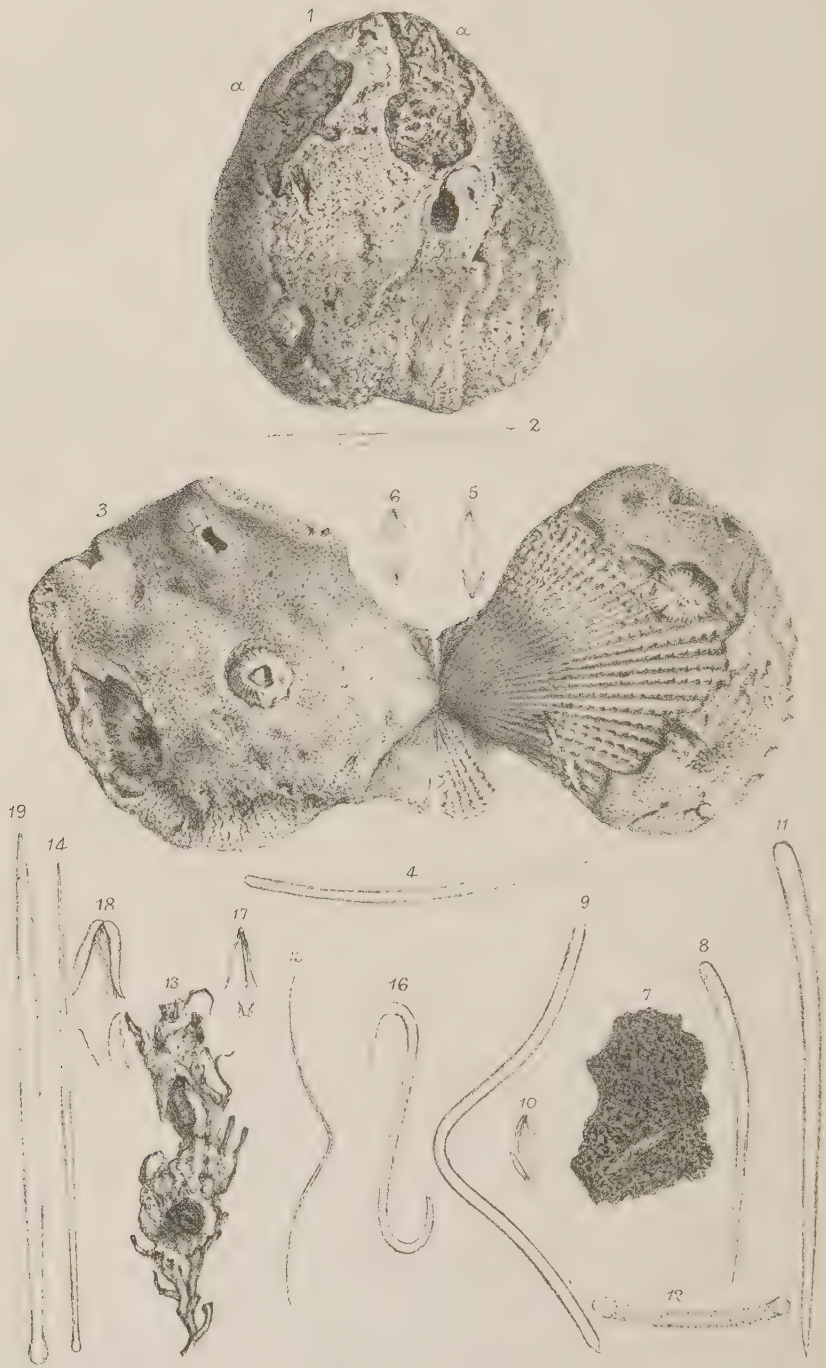
The surface is nearly even but not smooth, and the whole substance of the sponge is perforated so as to present the appearance of rough irregular lacework; the hispidation is not visible even by the aid of a two inch lens, but in sections of the sponge at right angles to its surface it is seen to be a well produced and constant character. It is caused by the radiation of the terminal spicula of the primary lines of the skeleton fibres of the sponge. Neither oscula nor pores are apparent.

The dermal membrane is pellucid and thin; it is rather abundantly furnished with its various spicula. The tension spicula are frequently as long as the skeleton ones, but not more than one fourth or one fifth of their diameter. The attenuato-acuate internal defensive spicula are small and slender, and appear more especially to belong to the membranous structures, upon which they are lying amidst the numerous retentive ones. Both forms of retentive spicula are very minute, rarely exceeding in length the diameter of a skeleton spiculum; they are about equally numerous, and very nearly of the same size. One of the anchorate form measured $\frac{1}{1555}$ inch in length, and an average-sized bihamate one $\frac{1}{1400}$ inch in length;

they are so minute and delicate in their structure that they require a microscopical power of 1000 linear to define them in a satisfactory manner. The two forms are irregularly dispersed in about equal proportions on the inner surface of the dermal, and on both surfaces of the interstitial membranes. This sponge is the second case of the occurrence of the singlar form of retentive spiculum, the bicalcarate bihamate one.

When we compare the specific description of *Isodictya Normani* with the species under consideration we observe a considerable amount of similarity in their organic structures, but although their organs closely approach each other in form they differ widely in their proportions. Thus the skeleton spicula of *I. Normani* are always more or less fusiform, and are not more than half the length and diameter of the purely acuate ones of *I. laciniosa*, while the proportions of the bicalcarate bihamate spicula in the two species are the reverse of those of the skeleton ones, those of *I. Normani* being the larger of the two species. Two full-sized spicula of *I. Normani* measured $\frac{1}{1147}$ and $\frac{1}{1272}$ inch in length; but the differences in their external form will always readily separate the one from the other when in an adult state.

Plate LXXVI.



Isodictya obscura 1-2. I. imitata 3-6. I. coriacea 7-12.
Raphiodesma sordida 13-19.

W. Lens Aldous del et lith. W. West & Co imp

PLATE LXXVI.

Isodictya obscura, *Bowerbank.*

Fig. 1.—Represents the type-specimen from the Diamond Ground off Hastings. Natural size. The dark parts opposite (*a a*) exhibit the surface of the sponge; the lighter parts covering the type-specimen are *Hymeniacidon lactea.*

Fig. 2.—One of the skeleton spicula. × 250 linear.

Isodictya imitata, *Bowerbank.*

Fig. 3.—Represents the type-specimen. Natural size.

Fig. 4.—An average-sized skeleton spiculum. × 250 linear.

Fig. 5.—One of the bidentate, equi-anchorate, retentive spicula from the dermal membrane. × 530 linear.

Fig. 6.—One of the minute, palmato-inequi-anchorate, retentive spicula from the dermal membrane. × 530 linear.

Isodictya coriacea, *Bowerbank.*

Fig. 7.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 8.—One of the sub-fusiformi attenuato-acuate defensive spicula of the porous areas. × 250 linear.

Fig. 9.—A tricurvate, cylindrical, tension spiculum. × 530 linear.

Fig. 10.—One of the equi-anchorate, bidentate, retentive spicula. × 530 linear.

Fig. 11.—An average-sized spiculum from the primary lines of the skeleton. × 250 linear.

Fig. 12.—One of the inequi-cylindrical, incipiently spinous spicula from the secondary lines of the skeleton. × 250 linear.

Raphiodesma sordida, *Bowerbank.*

Fig. 13.—Represents the type-specimen from Jersey in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 14.—One of the subclavate, fusiformi-acuate, tension spicula from the dermal membrane. × 250 linear.

Fig. 15.—A long and slender, tricurvate, acerate tension spiculum from the dermal membrane. × 250 linear.

Fig. 16.—One of the contort, bihamate, retentive spicula from the dermal membrane. × 530 linear.

Fig. 17.—One of the small, dispersed, bidentate, inequi-anchorate retentive spicula. × 530 linear.

Fig. 18.—A large, dentato-palmate, inequi-anchorate, retentive spiculum from one of the rosette-shaped groups of spicula. × 530 linear.

Fig. 19.—One of the skeleton spicula. × 250 linear.

Isodictya obscura, *Bowerbank.*

Plate LXXVI.

Sponge massive, sessile; surface even, but slightly rugose or papillate. Oscula simple, dispersed. Pores inconspicuous; dermal membrane pellucid, aspiculous. Skeleton rather compactly constructed, internally regular; primary lines rarely consisting of more than three or four spicula; secondary lines unispiculate; short and stout.

Colour.—In spirit dull, ochreous yellow.

Habitat.—Diamond Ground, Hastings; H. Ridley. Jersey, Rev. A. M. Norman.

Examined.—In spirit.

The simplicity of the structure of this species, and the close approximation of its spicula in size and proportions to those of several other species in the same section of the genus, renders it rather a difficult task to discriminate the difference existing between them. Although so closely approaching several congenerous species, I have been quite unable to assign it to any one of them.

It differs from *I. McAndrewii* in having the spicula rather shorter and stouter in their proportions, and in having the primary lines of the skeleton more abundantly spiculous, the lines being three, four, or more in thickness; while those of *I. McAndrewii* have rarely more than two fasciculated in the primary lines; nor is the skeleton tissue in that species so compactly constructed. The spicula in the two species very closely resemble each other in form, and vary but little in their average length, which is greatest in *I. McAndrewii;* the slight hispidation of its surface and the conical fistulous oscula of the last-named sponge also serve to further separate the two species.

The form and proportions of the spicula in *I. obscura* very closely resemble those of *I. cinerea*, but in the latter species the primary lines of the skeleton are unispiculous, and there is the same disproportions in the comparative length and stoutness of the skeleton spicula that exists in *I. McAndrewii*.

In *I. simplex* the skeleton spicula are of the same shape and length as those of *I. obscura*, but they are very much more slender in their degree of stoutness; and the surface of *I. obscura* has no indication of tuberous projections; nor is the surface minutely hispid as in *I. simplex*.

I obtained the type-specimen of this species from Mr. Ridley. It was brought up by one of the

trawlers on the Diamond Ground, off Hastings. It is two and a half inches long, two inches greatest breadth, and one and a half inch in thickness. It has been located on the back of one of the spider crabs, apparently from the remains of the carapace in a deep depression on the underside of the sponge, *Pisa tetraodon*, Leach. Only a small portion of the external surface of the specimen is visible, as it is thinly coated over to a very considerable extent by *Hymenacidon lactea*, for an account of which I must refer the reader to the description of Plate XXXII, fig. 9, in the present volume.

I received a single specimen of this species from the Rev. A. M. Norman; it is a small, irregularly-shaped mass not exceeding three lines in diameter. It was parasitical on a small branched fucus. The oscula are few in number; some of them rather exceeded a line in diameter. The dermal membrane is evenly spread over the distal terminations of the skeleton lines, and at the first view has the appearance of being furnished with a dermal network, but this appearance arises from its reposing immediately on the terminal portions of the skeleton tissues.

The skeleton has a strong and compact appearance. The primary lines are usually composed of rarely less than three or four spicula in thickness, and in many of them there are more than can be distinctly counted. The secondary lines have rarely more than one spiculum each. The generic character of the skeleton structure is well preserved in the outer portions of the sponge, but towards its central portions it might readily be mistaken for a *Halichondria*. Externally, both in its wet and dried state, it might readily be mistaken for a specimen of *Halichondria incrustans*.

Isodictya imitata, *Bowerbank*.

Plate LXXVI.

Sponge coating. Surface minutely hispid, even.

Oscula simple, small, numerous, rarely large. Pores inconspicuous. Dermal membrane pellucid, very sparingly spiculous; spicula retentive, bidentate, equi-anchorate, few in number, and rarely, very minute palmate inequi-anchorate ones. Skeleton diffused and irregular; primary and secondary lines multispiculous; spicula subflecto-acuate, small and slender. Interstitial membranes: tension spicula same as those of the skeleton, few and irregularly dispersed; retentive spicula same as in those of the dermal membrane, very few in number.

Colour.—In the dried state, brown with a tint of green.

Habitat.—Belfast, the late Wm. Thomson, Esq.

Examined.—In the dried state.

This sponge entirely covers one valve and partially so the other of a specimen of *Pecten varius*, its greatest thickness not exceeding three lines. It is the only specimen of the species I have seen, and I am indebted to my kind friend the late Wm. Thompson, Esq., of Belfast, for it. Its locality is probably Belfast Lough.

The sponge is in an excellent state of preservation. To the unassisted eye, the surface appears indistinctly reticulated from the great abundance of the minute oscula. The hispidation is not visible until a section of the sponge is mounted in Canada balsam, and it is then seen to be produced by the projection of the distal terminations of the primary skeleton lines. Beside the numerous minute oscula there is a large one nearly three lines in length by two in width on the under side of the projecting mass of the distal margin of the valve which bears the largest mass of the sponge. The dermal membrane does not appear to possess any tension spicula; occasionally one or two skeleton spicula cross the areas formed by the skeleton tissues immediately beneath, but I could not detect any immediately adherent to the inner surface of the dermal membrane, while on many of the clear transparent

areas of this tissue the retentive spicula were distinctly to be seen *in sitú* by the aid of a power of about 500 linear. They are very minute, and when separated by boiling in nitric acid and mounted in Canada balsam they require a microscopical power of 700 or 800 linear to render them distinctly to the eye.

The skeleton is very irregular in its structure; the primary linear are often very tortuous, and the secondary ones have frequently as many spicula in them as the primary ones, while at other times they are diffused in a series of single parallel spicula closely adjoining each other; so that unless a section of the sponge be made carefully at right angles to its surface, a very confused and unsatisfactory view of its structures will be obtained. The spicula of the skeleton vary considerably in their proportion as regards length, and many of them exhibit a tendency to be flecto-acuate. The interstitial membranes are sparingly furnished with tension spicula of the same form as those of the skeleton, and the retentive spicula are of very rare occurrence.

The nearest structural alliance to this sponge in the genus *Isodictya* is *I. uniformis*, with which it agrees very closely in its skeleton structure and in the form of its spicula, but in their proportions they differ slightly. In *I. uniformis* they are rather longer, being as five to four to those of *I. imitata*. The two sponges differ also in external characters; *I. uniformis* when dried being of a cream white, while *I. imitata* is brown, with a tint of green. The presence also in the latter of bidentate, equianchorate, retentive spicula in the dermal membrane; and the absence of tension spicula in that organ also mark the distinction between the two species in a satisfactory manner.

Isodictya coriacea, *Bowerbank*.

Plate LXXVI.

Sponge coating. Surface even, minutely hispid.

Oscula simple, minute, dispersed. Pores inconspicuous; congregated in irregular areas. Dermal membrane spiculous; defensive spicula of the porous areas sub-fusiformi, attenuato-acuate, basally incipiently spinous, few in number: tension spicula tricurvate cylindrical, slender, few in number; retentive spicula bidentate equianchorate, very minute, few in number. Skeleton dense and regular; primary lines; spicula subfusiformi, attenuato-acuate; occasionally subflecto-acuate, large, long, and rather few in number; secondary lines very numerous, one spiculum in width; spicula inequi-cylindrical, short and stout, incipiently spinous, terminations slightly inflated. Interstitial membranes, retentive spicula same as those of the dermal membrane, very few in number.

Colour.—In spirit, very dark brown.

Habitat.—Strangford Lough, Ireland; Rev. A. M. Norman, 1869.

Examined.—Preserved in spirit.

The specimen very closely resembles a fragment of the upper leather of an old shoe, both in colour and appearance. It is one inch in length, seven lines at its greatest width, and does not exceed one and a half line in thickness. The hispidation of the surface is not visible to the unassisted eye, but it is strikingly apparent in a section at right angles to the surface when mounted in Canada balsam, and the oscula require a two-inch lens to render them distinctly to the eye. In a thin slice from the dermal surface the porous areas and the pores when mounted in Canada balsam and viewed with a power of about 100 linear are very characteristic objects amidst the bristling field of spicula surrounding them; each area contains two or three rather large pores, and the defensive spicula of the areas are projected from their margins into their clear spaces, at intervals. The retentive spicula are best seen *in sitû* in the porous areas; the cylindrical tricurvate ones require a power of about 100 linear to render them distinctly visible, but the bidentate equi-

anchorate spicula cannot be distinctly defined, without the aid of a power of 600 or 700 linear. The skeleton is remarkably close and dense in its stricture, not from the strength of its primary lines, but from the profusion of the secondary ones, which are by no means always at right angles to the primary lines; but still the skeleton maintains a very symmetrical appearance in a section at right angles to the surface of the sponge. By a very careful examination of sections in Canada balsam I detected a few of each form of retentive spicula on the interstitial membranes, but they were of such rare occurrence that they might very readily escape the notice of a hasty observer. The remarkable structure of the skeleton and the peculiarities of the spicula render the discrimination of the species in a very satisfactory manner when examined in Canada balsam, but without the aid of this material the dark-coloured and abundant sarcode obscures nearly all the most discriminative characters of the sponge.

There are only two other British Isodictya, *I. infundibuliformis* and *I. dissimilis*, which have the spicula of the primary and secondary lines of different forms, and from both of them the species under consideration is readily distinguishable.

Raphiodesma sordida, *Bowerbank.*

Plate LXXVI.

Sponge coating, parasitical. Surface rugged and uneven. Oscula inconspicuous, simple, dispersed, minute. Pores inconspicuous. Dermal membrane spiculous; tension spicula subclavate acuate, occasionally subfusiform, of the same length and form of those of the skeleton, but much more slender, dispersed, rather numerous; rarely loosely fasciculated, and a few long slender tricurvate acerate ones. Retentive spicula; contort, bihamate, rather numerous; also bidentate, incqui-anchorate, dispersed, and dentato-palmate, in-

equi-anchorate ones congregated in rosette-shaped groups.

Skeleton. Fasciculi polyspiculous, compact, irregularly disposed; spicula subclavate, subfusiformi-acuate, stout, and rather long. Gemmules membranous.

Colour.—Living state, dark red or orange; pale green in spirit.

Habitat.—Jersey; Rev. A. M. Norman. Ramsgate, on old piles at extreme low water; Jas. T. Hillier, Esq.

Examined.—In the living state and from spirit.

The aspect of this sponge is by no means interesting or beautiful. It covers roughly and unequally the stem of a fucus for about one inch and a half, and in no part is thicker than about two lines. The ruggedness of the surface is produced by the projection at various angles of the large skeleton fasciculi beneath the dermis, and this character obtains in the sponge in its natural condition as well as when mounted in Canada balsam.

The oscula are not visible in its natural condition, but they are frequently apparent in portions of the dermal membrane mounted in Canada balsam, but I could not under any circumstances find open pores. The dermal membrane abounds in large tension spicula; they are irregular, dispersed on its surface, and occasionally they exhibit a slight tendency to fasciculation; and it frequently occurs that large skeleton fasciculi are disposed immediately beneath the dermal surface, and appear closely connected with it, but they do not really form any part of the dermal organization; the tension spicula of the dermal membrane are as long, and of the same form, as those of the skeleton, but not nearly so stout nor are their subclavate bases so fully developed. The contort bihamate, retentive spicula are numerous; they are all nearly of the same length, but differ, to some extent, in the degree of their stoutness; a fully developed one measured $\frac{1}{393}$ inch in length and its greatest diameter was $\frac{1}{7143}$ inch. The two forms of inequi-anchorate spicula are very minute; the

measurement of two of each form gave an average length of $\frac{1}{750}$ inch; both forms are of the same length. They are perfectly and beautifully developed, and require a linear power of about 700 to render them distinctly to the eye.

The skeleton fasciculi are very irregularly disposed, and each fasciculus contains a great number of spicula; the length of the fasciculus seldom exceeds twice that of a spiculum. The spicula are not mixed indiscriminately; their bases are all seen at one extremity of the fasciculus, while at the other end there are apices only visible. At each end the spicula are slightly divergent, while in the middle of the fasciculus the apices of one series and the bases of the other are closely cemented together. The skeleton spicula are all more or less basally clavate, and their shafts are usually distinctly fusiform. The interstitial membranes are abundantly supplied with dispersed spicula of the same size and form as those of the skeleton fasciculi; very few contort, bihamate spicula could be detected among them, while on the dermal membrane they are abundant.

Very few gemmules were visible. Since the above description was written, I have received portions of three small specimens of the species dredged by Mr. Jas. J. Hillier, off Ramsgate. They vary in their size and general aspect to a considerable extent from the type-specimen from Jersey. Mr. Hillier in his letter states: "It occurs as a mere film like a little fresh glue on the tubes of Sabellaria;" and in a second note he adds, "I have been able to get two more specimens of the sponge of which I enclose pieces; they are very poor little things, but it seems almost impossible to peel off any much larger than those sent, as it is such a mere film on the very uneven tubes built up by Sabellaria, on which only I have found it. I have now met with it five or six times, and in no case have I seen it more developed than that which I now send you;" and he subsequently adds, "when a piece is stripped off its habitat it appears to shrink up as if elastic." This

slow shrinking is a vital action not uncommon among sponges under similar conditions.

The specimens sent to me by Mr. Hillier are each four lines in length by about one and a half line in breadth, and were not of greater substance than thin writing paper; both were mounted on thin glass slips; while in their natural state they presented the same rugged and uneven surface that characterises the type-specimen. I covered them with Canada balsam and thin glass, and several beautiful rosette-shaped groups of the palmato-anchorate spicula were at once rendered visible. Mr. Hillier had previously advised me of their occurrence in the sponge. I did not succeed on finding these spicula thus arranged in the type-specimen, so that the discovery of the groups by Mr. Hillier brings this interesting specific character into a closer relation to the type sponge of the genus, *R. lingua*. Although varying in size and substance from the type-specimen of the species to so great an extent, they were in perfect accordance in every one of their anatomical details.

The specimens of this species described above were sent to me on the 22nd November, 1871, by Mr. Hillier, and on the 19th of December following, I received a living specimen of the sponge from him in a bottle of sea water. In the note accompanying the specimen he writes, "We have had an exceedingly low tide, so that some old piles at the mouth of our Harbour were exposed, and my man who collects for me in winter was able to get some of the sponge, of which I have sent you a piece." This specimen is an irregular patch of about two inches in diameter. It is exceedingly rugged on its external surface, as it has spread itself over all the irregular growths that previously existed on the old wooden pile. Its average thickness does not exceed that of the type-specimen from Jersey, but it differs from that sponge in being in the living condition of a dark red or orange colour, and a great portion of its living colour remained after immersion in

spirit for more than twenty-four hours. This specimen adds considerably to our knowledge of the habits and external characters of the species. In its anatomical character it is strictly in accordance with the specimens previously described.

Raphiodesma, *Bowerbank.*

In the course of the re-examination of the species of my genus Hymeniacidon for illustration in the present volume I was struck by the discrepancies in the structure of the skeleton of the species that I had designated in vol. ii, page 187, *Hymeniacidon lingua*, as compared with the skeletons of the other species of that genus. I had also the advantage of the examination of a series of specimens of the species under consideration in a fine state of preservation, that I had received from my friend Mr. Peach, and from which I felt convinced of the necessity of establishing a separate genus for the reception of sponges having the fasciculated skeleton structure of the one I had designated *H. lingua*, and I was the more strongly confirmed in this idea by the acquirement of a second species, *Raphiodesma sordida*, in which the skeleton structures are in perfect accordance with those of the species I had designated *Hymeniacidon lingua*.

I propose, therefore, the following characters as those of the new genus.

Raphiodesma, *Bowerbank.*

Plate XLVII, fig. 8.

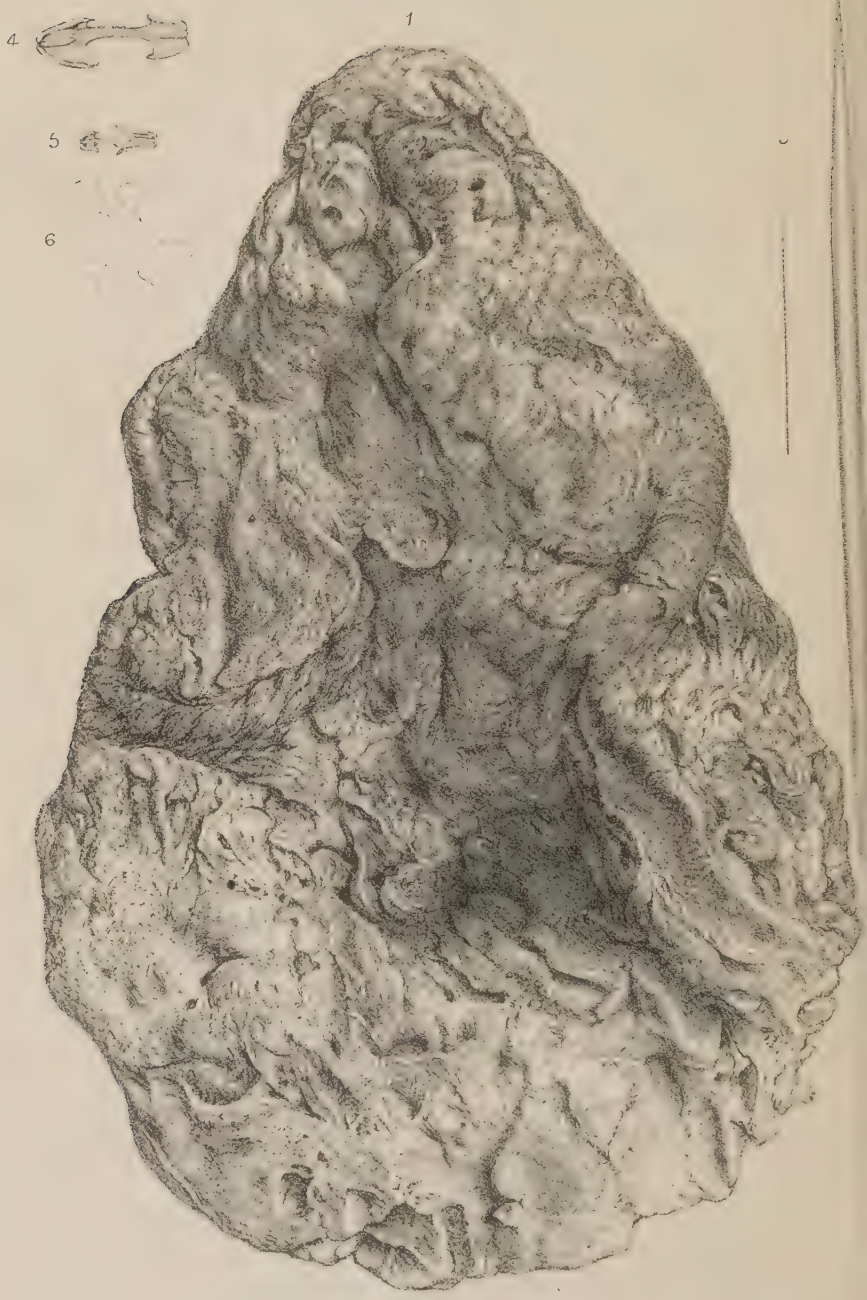
Skeleton. Without fibre, composed of an irregular network of polyspiculous faggot-like bundles; the spicula of which are compactly cemented together at the middle, but are radiating at their terminations.

The structure of the skeleton in this genus is very remarkable. It is composed of numerous fasciculi of spicula like elongated faggots, the central portions being compactly cemented together, while both terminations present a loosely radiating appearance. The mode of

disposition of the fasciculi in the skeletons is, as if they had been thrown carelessly together in every possible diagonal direction, the interstices of the skeleton forming elongated angular areas, like those of a confused mass of netting extended in one direction only. The fasciculi in the type-specimen are large and long, each consisting of many more spicula than it is possible to count. The bundles are usually independent of each other, but occasionally they are connected laterally by the offset of a few spicula on a slender bundle running from the one to the other. The general connection is by the intermixture of their terminal radial spicula, or by single spicula disposed at nearly right angles to the general direction of the skeleton fasciculi.

There are but three genera with which this one is at all likely to be confounded, and these are Halichondria, Hymedesmia and Desmacidon. Raphiodesma differs from Halichondria by the distinctly and compactly fasciculated structure of the reticulation, and by the apparent disconnection of the parts of the rete. It also differs from Hymedesmia, by the fasciculi always forming a connected though disjointed network; while in the last-named genus the fasciculi are normally separate. The compactly fibrous structure of the middle portions of the fasciculi of Raphiodesma simulate very closely the structure of the truly continuous fibre of a Desmacidon, but their universal want of continuity distinctly characterises them as fasciculi and not multispiculous keratose fibre. Figure 8, Plate XLVII, represents a portion of the skeleton of *R. lingua* exhibiting the form and arrangement of the faggot-like bundles of which it is composed, from the specimen represented in Plate LXXVII, fig. 1.

Plate LXXVII.



Raphiodesma lingua.
See also Plate XLVII. Fig. 8.

W. Lens Aldous del. et lith.

W. West & C° imp.

PLATE LXXVII.

RAPHIODESMA LINGUA, *Bowerbank.*

Hymeniacidon lingua, Bowerbank. Mon. Brit. Spongiadæ, vol. ii, p. 187, and vol. i, pl. vi, figs. 144—147, also pl. xviii, fig. 297; and vol. iii, pl. xlvii, fig. 8.

Fig. 1.—A fine and very perfect specimen of the sponge from Shetland in its dried state. Natural size.

Fig. 2.—Represents one of the skeleton spicula. × 150 linear.

Fig. 3.—One of the tension spicula. × 320 linear.

Fig. 4.—A large dentato-palmate, inequi-anchorate spiculum from one of the rosette-shaped groups on the inner surface of the dermal membrane. × 250 linear.

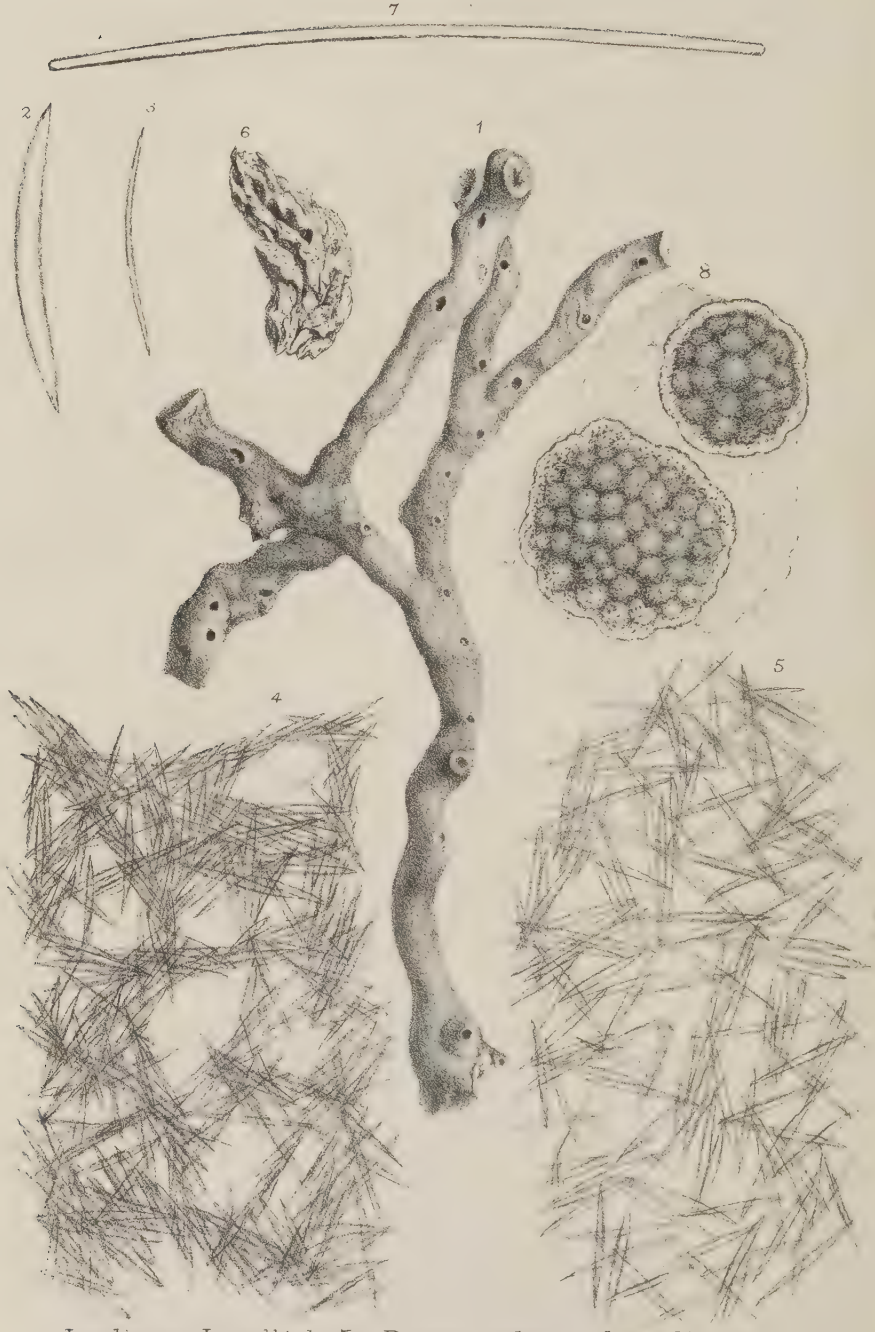
Fig. 5.—One of the smaller-sized spicula of the same description of form as that represented by fig. 4. They are never congregated in rosette-shaped groups, but are abundantly dispersed on the inner surface of the dermal membrane. × 250 linear.

Fig. 6.—A group of simple and contort, bihamate spicula. They are very abundantly dispersed on the membranous tissues. × 250 linear.

For an account of the growth and development of the large dentato-palmate, inequi-anchorate, retentive spicula I must refer the reader to vol. i, p. 48, Plate vi, figs. 144—147, of 'Mon. Brit. Spongiadæ,' and to p. 49, Plate xviiii, fig. 297, in the same volume for a description and figure of their congregation in rosette-formed groups.

In my first description of this sponge I stated that the large inequi-anchorate spicula are "congregated at distant intervals in radiating circles." Subsequent re-

Plate LXXVIII.



Isodictya Ingalli 1–5. Desmacidon columella 6–8.

W. Lens Aldous del et lith. W. West & Co imp.

PLATE LXXVIII.

Isodictya Ingalli, *Bowerbank.*

Fig. 1.—Represents one of the most characteristic of the three specimens in my possession. Natural size.

Fig. 2.—A fully-developed skeleton spiculum. × 250 linear.

Fig. 3.—A young and slender spiculum. × 250 linear.

Every degree of tenuity may be seen between this spiculum and the one represented by fig. 2, but the latter prevails greatly in number.

Fig. 4.—Represents a small piece of the dermal membrane of *I. Ingalli.* × 123 linear.

Fig. 5.—A small piece of the dermal membrane of *I. simulans.* × 123 linear. Exhibiting the essential differences in the two structures.

Desmacidon columella, *Bowerbank.*

Fig. 6.—Represents the type-specimen from the cabinet of Mr. Edward Parfitt. Natural size.

Fig. 7.—One of the fusiformi-cylindrical skeleton spicula. × 250 linear.

Fig. 8.—Two of the gemmules *in sitú* on a portion of the interstitial membranes. × 530 linear.

Isodictya Ingalli, *Bowerbank.*

Plate LXXVIII.

Sponge. Branching irregularly, hard and rigid in the dried state. Surface smooth. Oscula simple, slightly

elevated, nearly all on one face of the sponge. Pores inconspicuous. Dermis strongly reticulated, rete irregular, polyspiculous; spicula acerate, short, and stout; dermal membrane aspiculous. Skeleton very regular; radial lines polyspiculous; secondary lines rarely more than trispiculous; spicula acerate, short, and stout, same size as those of the dermis.

Colour.—In the dried state light fawn-yellow.

Habitat.—Southport, Lancashire? G. Graves, Esq.

Examined.—In the dried state.

I received three specimens of this species, among other British sponges, from the collection of my late friend Mr. Thomas Ingall, and accompanying them there was a card on which was written, "Southport, Lancashire, G. Graves, Esq." The three specimens varied in size, but in every other external character they resembled each other very closely. The largest specimen was eight and a half inches in height; the other two were each about five inches high. There is a considerable amount of resemblance between this species and *Isodictya simulans;* they are alike hard and rigid when dried, and the position and general aspect of their oscula are the same. Their spicula are also as nearly as possible of the same size and form, but there does not appear to be any disposition on the part of *I. Ingalli* to assume the latticed form that prevails in *I. simulans* in its fully-developed condition, and the branches in the latter are stouter than in the former species; the colour also appears to differ in the two species, but this character is so uncertain that very little reliance can be placed on it. Their external characters will, therefore, scarcely separate the two species, but fortunately their structural peculiarities readily and strikingly distinguish them. Each of the species has a well-developed, dermal, reticulated system. In *I. simulans* the rete is unispiculate, and the areas mostly affect a triangular form, but this arrangement does not prevail in the dermis of *I. Ingalli*, and the rete so abounds in spicula that their

number can rarely be determined, while the areas are large and irregular, thus producing a striking and very characteristic specific difference between the two sponges. The arrangements of the skeleton structures of the two species would scarcely distinguish them, although those of *I. Ingalli* appear to be much more regular than those of *I. simulans*.

Desmacidon columella, *Bowerbank*.

Plate LXXVIII.

Sponge. Massive, ascending, compressed. Surface smooth, uneven, with deep furrows. Oscula terminal? Pores inconspicuous. Dermal membrane spiculous; spicula dispersed or subfasciculated, same form and size as those of the skeleton. Skeleton: fibres stout, and compact, rete coarse and open, spicula fusiformi-cylindrical, long, and rather slender. Interstitial membranes spiculous. Spicula same as those of the skeleton, rather abundantly dispersed. Gemmules membranous, aspiculous, large, and pellucid at their margins, with a central nucleus more or less distinct.

Colour.—White, with dark orange longitudinal veins when alive. Light brown in the dried state.

Habitat.—Exmouth, in tidal pools; Mr. Edward Parfitt.

Examined.—In the dried state.

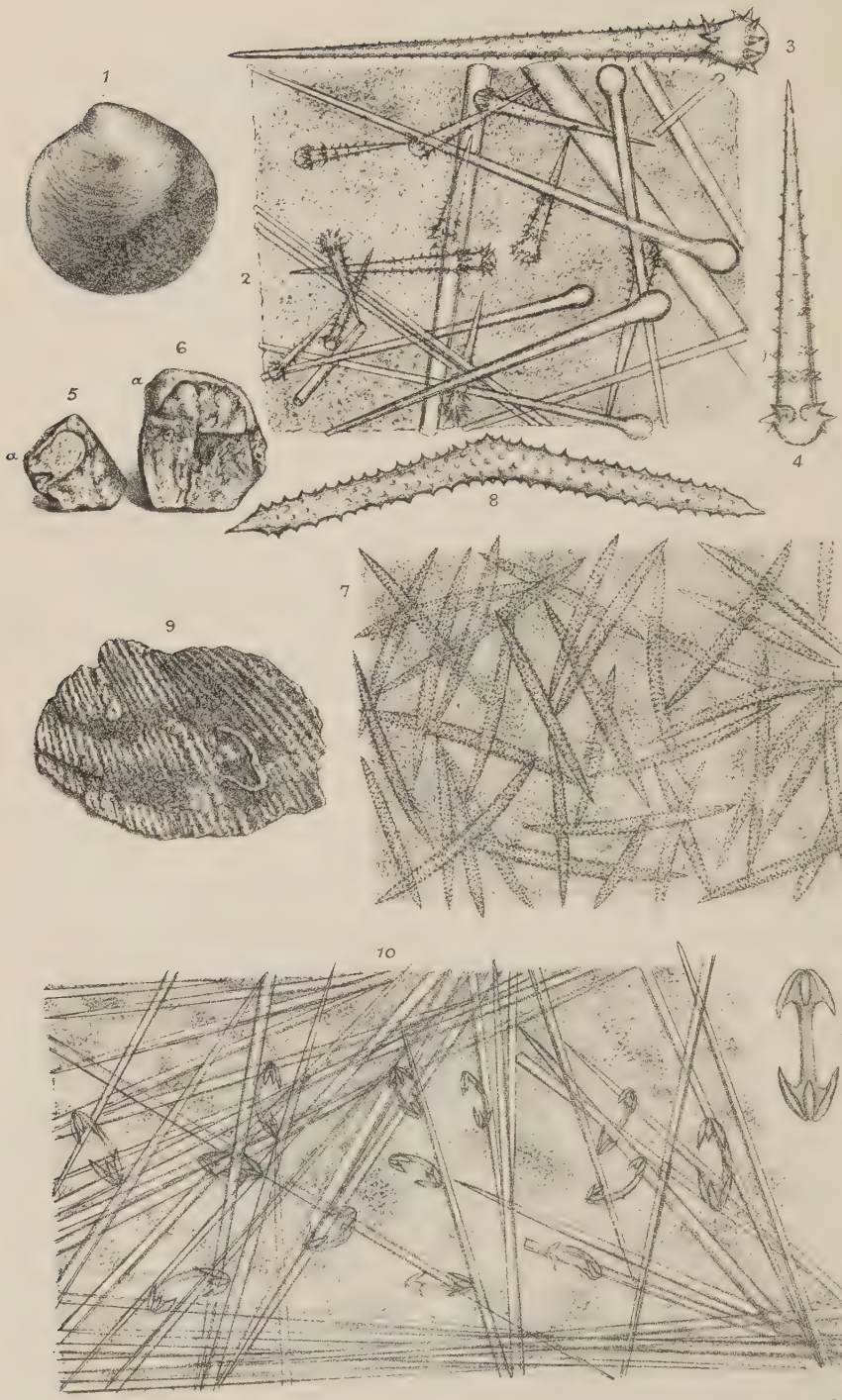
I am indebted to Mr. Edward Parfitt, of Exeter, for my knowledge of this interesting species of sponge. In form it is a slightly curved compressed column, decreasing in breadth from near the base to its apex. The half of the specimen kindly presented to me by Mr. Parfitt is fourteen lines high, and six lines at its greatest breadth near the base. Mr. Parfitt states in the letter which accompanied the specimen that it was "found at Exmouth in tidal pools, but very rare. When alive it was like an Ascidian, for which I took it when seen growing. Colour nearly white, with two or

three dark orange vein-like colourings on the body of the sponge reaching from bottom to top." He further states that there was "one osculum only, and that situated at the apex, smooth, and very slightly raised above the membrane." In the half of the sponge I received for examination there are no indications of the osculum described by Mr. Parfitt.

The dermal membrane is thin and pellucid, but abundantly covered with sarcode within, in which the tension spicula are in some parts rather sparingly and evenly dispersed, while in other parts they are more abundant, and frequently loosely fasciculated. The rete of the skeleton is stout, the fibres frequently anastomising, forming elongated interstices, on the membranes of which the tension spicula are rather abundantly and irregularly dispersed.

The gemmules in this specimen form a very striking character. They are membranous like those of other species of Desmacidon, but they are strikingly different in their size and general appearance from those in either *D. Jeffreysii* or *D. pannosus*. When fully developed they appear pellucid at their margins, while their central portions are completely filled with closely-packed, small, transparent, globular molecules. The gemmules are exceedingly abundant, and in some parts so much so as to completely obscure the tissues beneath them. They vary greatly in size. One of the largest and best developed measured $\frac{1}{286}$ inch in diameter, while a smaller one did not exceed $\frac{1}{1200}$ inch in diameter, and a very considerable number of them were still smaller. The globular molecules within the largest one measured were $\frac{1}{2678}$ inch in diameter. When present the gemmules will always form a striking specific character, but the species can never be confounded with any other known British Desmacidon, as it is the only one which has a skeleton constructed of fusiformi-cylindrical spicula, and a further character is the total absence of any other forms of spicula than those of the skeleton.

Plate LXXIX.



Hymeraphia coronula 1–4. Hymedesmia inflata 5–8.
Hymedesmia occulta 9–11.

W. Lens Aldous del. et lith.
W. West & Co. imp.

PLATE LXXIX.

Hymeraphia coronula, *Bowerbank.*

Fig. 1.—Represents the type-specimen on the surface of a small bivalve shell from Shetland. Natural size. In the cabinet of the Rev. A. M. Norman.

Fig. 2.—A small portion of the sponge mounted in Canada balsam, showing the spicula *in situ*. × 250 linear.

Figs. 3 and 4.—Two of the attenuato-spinulate, entirely-spined, internal defensive spicula, exhibiting the peculiar circlet of spines on the basal bulb. × 530 linear.

Hymedesmia inflata, *Bowerbank.*

Figs. 5, 6.—Two of the pebbles from Shetland, having patches of the sponge upon them at *a a*. Natural size.

Fig. 7.—A small piece of the sponge mounted in Canada balsam, exhibiting the characteristic forms and mode of disposition of the acerate, entirely-spined spicula of the dermal membrane. × 250 linear.

Fig. 8.—One of the angulated, entirely-spined, acerate spicula of the dermal membrane. × 530 linear.

Hymedesmia occulta, *Bowerbank.*

Fig. 9.—Represents the type-specimen on the fragment of an old Pecten shell. Natural size. In the cabinet of the Rev. A. M. Norman.

Fig. 10.—A portion of the sponge mounted in Canada balsam, exhibiting the mode of the disposition of the spicula. × 250 linear.

Fig. 11.—One of the large, tridentate, equi-anchorate, retentive spicula. × 530 linear.

Hymeraphia coronula, *Bowerbank.*

Plate LXXIX.

Sponge. Coating, thin. Surface uneven, both strongly and minutely hispid. Oscula simple, dispersed; pores inconspicuous. Dermal membrane spiculous; tension spicula acerate, very long and slender, flexuous, dispersed singly or fasciculated, fasciculi frequently polyspiculous; external defensive spicula, the larger arising from the projection of the distal extremities of the skeleton spicula through the dermal membrane; the smaller ones attenuato-spinulate, entirely-spined, basal bulb often coronulated spinuously. Skeleton: spicula spinulate, very long and large, distal end usually projected through the dermal membrane. Basal membrane pellucid: tension spicula same as those of the dermis, dispersed singly, few in number; internal defensive spicula same as those of the dermal membrane; sarcode abundant.

Colour.—Dried, light grey.

Habitat.—Shetland, Rev. A. M. Norman.

Examined.—In the dried state.

The sponge covers about one third of the outer surface of a small bivalve shell. The surface of the sponge is very irregular, and has numerous extraneous matters incorporated in it. The hispidation, when viewed as an opaque object, is seen to be produced to a great extent by the projection of the large skeleton spicula through the dermis, frequently to the extent of more than half their length; the smaller or secondary hispidation is effected by the small attenuato-spinulate, entirely-spined, defensive spicula, the bulbs of which are within the dermal membrane, and the shafts only appear externally; so that when we view the internal surface of the dermal membrane in Canada balsam, with a power of about 300 linear, we observe two sets of these defensive spicula; one having their shafts projecting from the basal membrane inward towards

the eye, while those of the other set are projected through the dermal membrane, but the bulbs of both sets are based on the inner surface of the basal membrane. The acerate tension spicula of the spinulate skeleton spicula are both of them very large and long for so small a species of sponge. The tension spicula are very slender and very acutely terminated, but they frequently exceed $\frac{1}{40}$ inch in length.

In some of the dermal fasciculi they are too numerous to be counted, while in others there are not more than from two to four or five together. The skeleton spicula frequently exceed $\frac{1}{18}$ inch in length; they are stout and strong in their proportions, and are frequently flexuous; they rarely occur two together on the basal membrane, and from the mode of their attachment they seem to have facile powers of motion when variations in the direction of the shaft becomes necessary.

The attenuato-spinulate, entirely-spined, defensive spicula are comparatively small; they rarely exceed $\frac{1}{100}$ inch in length; they scarcely ever occur together, but are generally disposed at about equal distances from each other.

The spination of the spherical base of some of these defensive spicula very frequently exhibits a remarkable character in the form of a circular band of spines around its greatest circumference, while the proximal and distal portions of the sphere are entirely without spines.

In such cases the spination of the shaft of the spiculum does not commence until about half or a whole length of its own diameter above the spherical base, and continues thence more or less to the distal end of the spiculum. The spines are acutely conical, and are projected at right angles to the axis of the spiculum.

I have a strong suspicion that the coronulated, attenuato-spinulate, defensive spicula are more especially devoted to the external defenses of the sponge, but although I have seen the smooth basal surface and the

corona of spines of many of them embedded in the sarcode of the inner surface of the membrane while their shafts were projected from its outer surface, there has always been such an accumulation of semi-opaque sarcode around them as to prevent a clear and satisfactory view of their embedment and structure. The peculiarities of their spination would seem to favour the idea I have enunciated; the circlet of spines would assist in retaining them in their positions, while the smooth space between the circlet of spines and the commencement of the spination of the shaft would allow not only of their closer envelopment by the surrounding membrane, but also of a certain amount of free motion to provide against external contingencies.

Hymedesmia inflata, *Bowerbank.*

Plate LXXIX.

Sponge. Coating, thin. Surface even, smooth. Oscula simple, small. Pores inconspicuous. Dermal membrane, abundantly spiculous; spicula acerate, profusely spinous; frequently angulated, inflato-acerate; spines irregularly dispersed, acute, exceedingly numerous. Skeleton fasciculi. Spicula acerate, slender, numerous and closely packed; occasionally large and long, and rarely, with a central inflation, dispersed; and also very large and long, spinulate or rarely acuate spicula irregularly dispersed, and always prostrate beneath the dermal membrane. Internal defensive spicula. Attenuato-spinulate, entirely and profusely spinous, short and stout, spinulate base largely developed; spines acute, frequently recurved; spicula very few in number.

Colour.—Light brown in the dried state.

Habitat.—Shetland, Mr. W. C. Peach.

Examined.—In the dried state.

I found three specimens of this species among a considerable number of small pebbles from Shetland, having thin patches of Hymeraphias and Hymedesmias

upon them, from which they could be distinguished only by a microscopical examination. When a small portion of the sponge is mounted in Canada balsam, the striking character of the dermal membrane, with its profusion of comparatively large acerate spinous spicula and the great spinulate ones reposing beneath it, at once leads to a discrimination of the species. In two of the specimens examined, the characters to which I have alluded above were very distinctly rendered to the eye by a power of 108 linear, but in the third specimen, which appears to have been an older sponge, the dermal spicula were so numerous and so closely matted together that it required a power of 183 linear to render them distinctly to the eye. The structures beneath were not visible, and a reversal of the specimen became necessary to obtain a distinct view of them.

The whole of the structures are very striking and remarkable. The dermal spicula vary to some extent in their structural characters; many of them are purely acerate, while others are more or less inclined to be fusiformi-acerate; but all are profusely spinous, and a very considerable number of them are more or less bent angularly at the middle, and at or near the bending point many of them are inflated; but the latter character is not so frequently met with as the angulation of the spiculum. In the most mature of the three specimens the fasciculi of the smallest skeleton spicula were very numerous, crossing each other at all angles; the larger acerate spicula, which are disposed singly or sometimes fasciculated five or six together, were dispersed in an equally irregular manner, and one in about five or six of them had the inflation at about the middle of the shaft. The great spinulate and the few large acuate spicula are rather abundant, but I never observed them to be fasciculated, nor any of them to be projected through the dermal membrane; these spicula are very remarkable for their great length and their stout proportions. The internal, attenuato-spinulate, defensive spicula are very few in number,

and it was only in the oldest and most mature of the three specimens that I detect them.

The only sponge that is liable to be hastily confounded with this species is *Halichondria albula*, which presents a very similar dermal arrangement; but a careful examination will soon display the difference in the structure of their spicula and the other differential characters of the two species.

Hymedesmia occulta, *Bowerbank.*

Plate LXXIX.

Sponge. Parasitical coating. Surface irregular, abundantly hispid. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula, acerate, large and long, dispersed; retentive spicula bi- and tridentate equi-anchorate, large and stout, numerous, dispersed. Skeleton fasciculi multispiculous; spicula very numerous, same as those of the dermal membrane, with an admixture of stout fusiformi-acerate ones. External defensive spicula attenuato-acuate; size various; large ones basally spined, smaller ones, entirely spined.

Colour.—Milk white in the dried state.

Habitat.—Shetland, ninety-six fathoms; Rev. A. M. Norman.

Examined.—In the dried state.

I received this singular little sponge from the Rev. A. M. Norman, who obtained it by dredging in ninety-six fathoms at Shetland. It is based at the distal margin of a fragment of an old Pecten shell, and it occupies a space rather less than the quarter of an inch in length by about the eighth of an inch in breadth; and it is so like in colour to the fragment of shell on which it is thinly spread, that it is difficult to distinguish it from the shell surface, even with the aid of a lens of two inches focus.

Viewed as an opaque object by direct light, with a

power of 100 linear, the surface is seen bristling with numerous large, external defensive spicula, which are projected to the extent of half or two thirds their length beyond the dermal membrane, to which numerous minute grains of sand are attached that obscures it to such a degree as to render exceedingly doubtful the characters derivable from the oscula and pores; the former appear to be simple, dispersed, and few in number.

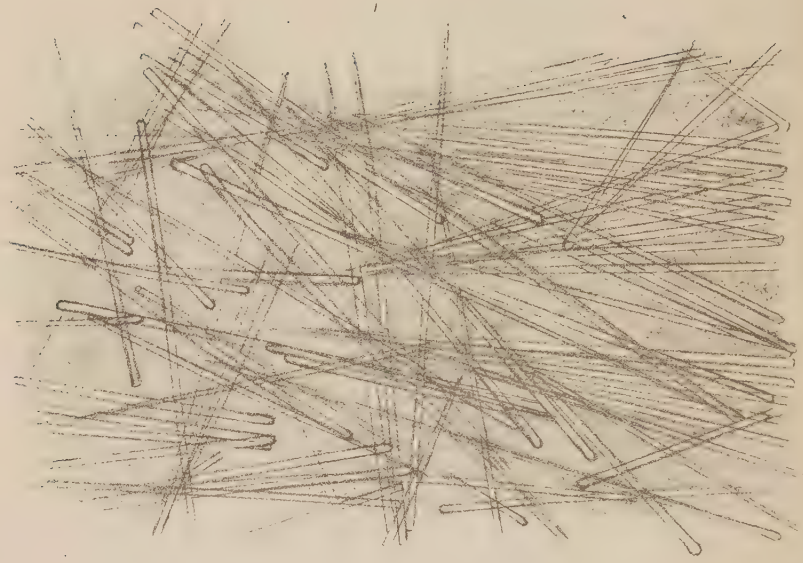
The dermal membrane is translucent, and the large long tension spicula are evenly disposed singly in every possible direction, and it is rarely that two or three are fasciculated together. In the areas formed by this mode of disposition we find the stout, retentive bidentate, equi-anchorate, spicula cemented by the middle of their shafts to the membrane, their anchorate terminations projected outwards.

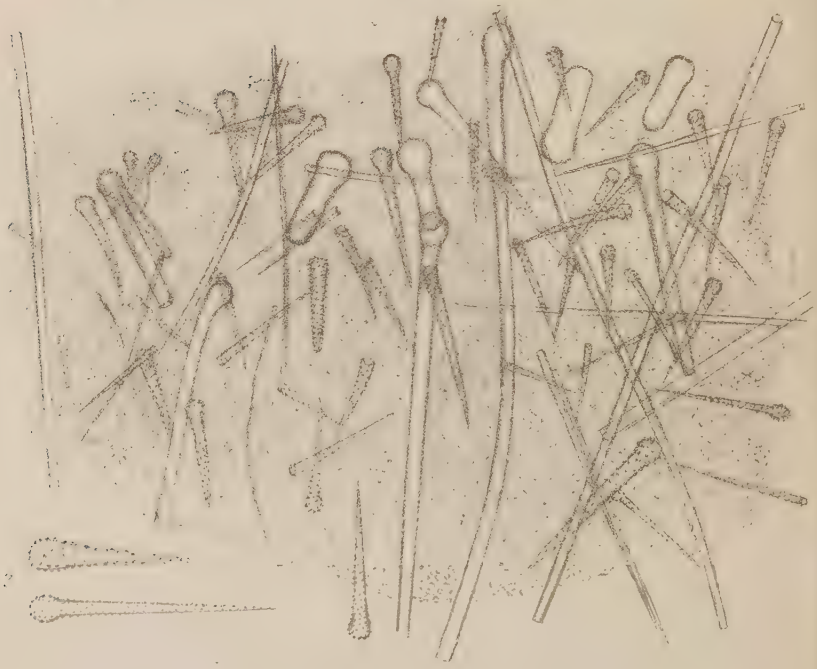
The fasciculi of the skeleton structure are very full of spicula, and do not appear to assume any definite direction in the mode of their disposition. The spicula of the skeleton, as well as those of the dermis, are mostly of a regular acerate form, but occasionally a few stout fusiformi-acerate ones are mingled with them.

The external defensive spicula are very characteristic in this sponge. They are of two descriptions; both of them are attenuato-acuate, but differing from each other greatly in size; the larger ones being very much stouter than a skeleton spiculum, and half as long again, and having the basal portion for about one fourth of the whole length abundantly spinous, and especially so the extreme basal portion. The smaller form or defensive spiculum is not more than about half the length of a skeleton spiculum, slender in diameter, and is profusely spinous from base to apex. This difference in size and armature between the two forms of defensive organs is a remarkable feature in the structure of the sponge.

Although this species appears so insignificant as a

whole, its parts, when viewed microscopically, are bold and strikingly characteristic in their structure, and are readily distinguishable from those of any other known British species of the genus.





Hymedesmia simplicima 1. Hymeraphia simplex 2–3.

W Lens Aldous del. et lith. W West & Co imp.

PLATE LXXX.

HYMEDESMIA SIMPLICIMA, *Bowerbank.*

Fig. 1.—Represents a portion of the type-specimen of the species × 123 linear, exhibiting the mode of disposition of the skeleton fasciculi.

HYMERAPHIA SIMPLEX, *Bowerbank.*

Fig. 2.—A portion of the type-specimen of the species × 123 linear, showing the skeleton and external defensive spicula and the attenuato-spinulate, internal, defensive spicula *in situ.*

Fig. 3.—Two of the internal, defensive spicula × 250 linear, exhibiting the variety of their forms and the degree of their spination.

HYMEDESMIA SIMPLICIMA, *Bowerbank.*

Plate LXXX.

Sponge. Coating. Surface uneven, but smooth. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, aspiculous. Skeleton fasciculi mostly multispiculous, occasionally formed of very few spicula. Spicula spinulate, very rarely acuate, large, and long, intermixed with very long, slender, and often sinuous ones of the same form.

Colour.—In the dried state cream white.

Habitat.—Shetland, off Balta; Rev. A. M. Norman.

Examined.—In the dried state.

I received a single specimen of this sponge for examination from the Rev. A. M. Norman, who dredged

it in 1867 off Balta, Shetland. It coats the surface of a small fragment of slate-coloured schistus not more than four lines square. The thickness of the sponge varies from not exceeding that of paper to about half a line. The surface is very uneven, rising in several places into minute hillocks, and it is in many parts covered with minute grains of sand which are too firmly adherent to be readily washed off. When not thus covered it is quite smooth. The oscula were not readily to be detected in Canada balsam, but by direct light under a power of about 100 linear they were distinctly visible; they were simple and minute. No pores could be detected.

The skeleton is loosely fasciculated and very irregularly disposed; many of the bundles are multispiculous, while in other cases they contain not more than from two to six or seven spicula; and numerous single spicula cross them in every possible direction; and in some of the thickest portions of the sponge they are so numerous as to render the skeleton structures very like those of a Hymeniacidon, but in the thinner portions the distinction between the two modes of structure is very apparent in consequence of the spicula forming a fasciculus, having their bases and apices always coincident, a mode of arrangement never met with in a Hymeniacidon. The spinulate spicula are large, long, and rather slender, and intermixed with the fully-developed skeleton ones are a few, exceedingly slender and frequently flexuous. The fully-developed spicula vary to a considerable extent in the degree of the production of their globular bases, varying from completely spherical down to almost purely acuate, but the latter form is of rare occurrence. I could not detect any other form of spiculum in the sponge than those I have described above.

Hymeraphia simplex, *Bowerbank.*

Plate LXXX.

Sponge. Coating, very thin. Surface undulating, strongly hispid. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, aspiculous. Skeleton and external defensive spicula attenuato-spinulate, very long and slender. Tension spicula long and very slender, frequently sinuous, solitary, or loosely fasciculated. Internal defensive spicula, attenuato-spinulate, entirely incipiently spinous; spines acutely conical.

Colour.—In the dried state pale yellow.

Habitat.—Shetland, off Balta; Rev. A. M. Norman.

Examined.—In the dried state.

I received two specimens of this species from the Rev. A. M. Norman, who dredged them at Shetland, off Balta. They coated very thinly portions of the surface of two small fragments of slate-grey stone. A portion of the largest specimen is represented by the figure. The second one is not more than half the size of the figure one.

The structures of the sponge are distinctly different from those of any other spinulate species of the genus with which I am acquainted. Examined by direct light with a power of 100 linear it appeared strongly hispid by the projection of the long skeleton spicula through the dermal membrane; a few of them were in an erect position, but by far the greater number were more or less procumbent. A few simple oscula were to be seen dispersed on the surface, but no indication of pores could be discovered. The greatest thickness of the sponge does not exceed that of stout writing paper, but the length of one of the most perfect of the skeleton spicula was $\frac{1}{12}$ of an inch, its greatest diameter being $\frac{1}{937}$ inch. This spiculum was in a procumbent position, while others, more or less erect, varied considerably in their height, being from half to

two thirds of the length of the one measured. The spherical bases of these spicula are well produced. The thickest part of the shaft is close to the base, whence it gradually attenuates, terminating very acutely. The internal defensive spicula were rather numerous, and were mostly in a more or less erect position, but many of them were procumbent. They vary considerably in size; one of the largest measured $\frac{1}{116}$ inch in length, its greatest diameter near the base being $\frac{1}{3000}$ inch, while a small one did not exceed $\frac{1}{240}$ inch in length. The tension spicula are long and exceedingly slender; they are mostly dispersed singly amid the sponge, but occasionally a few of them occur together in a loose fasciculus.

Plate LXXXI.

Normania crassa.

Mrs Gibbons del et lith.
W. West & Co. imp.

PLATE LXXXI.

NORMANIA, *Bowerbank.*

Fig. 1.—Represents the type-specimen of *Normania crassa* of the natural size.

Fig. 2.—A small portion of a section of the sponge at right angles to its surface, exhibiting the irregularity of the structure of the fasciculi of the skeleton and of their mode of disposition. × 25 linear

Fig. 3.—A portion of dermal inhalent surface from the exterior of the sponge, showing the "short fasciculi of siliceous spicula" and the disposition of the inhalent pores. × 36 linear.

Fig. 4.—A sub-fusiformi, acerate skeleton spiculum. × 80 linear.

Fig. 5.—An expando-ternate connecting spiculum of the normal form, with a very short shaft. × 80 linear.

Figs. 6, 7, and 8.—Three of the various abnormal forms of the connecting spicula, usually found irregularly dispersed a short distance beneath the dermal membranes. × 80 linear.

Fig. 9.—One of the small sub-fusiformi acerate tension spicula of the interstitial membranes. × 80 linear.

Figs. 10 and 11.—Two of the large attenuato-stellate, retentive spicula. × 250 linear. These spicula agree with each other very nearly in size but not in the number of their radii.

Fig. 12.—One of the small elongo-attenuato-stellate, retentive spicula. × 250 linear.

Normania, *Bowerbank.*

Plate LXXXI.

Skeleton composed at the external surfaces of short fasciculi of siliceous spicula; in the interior, of an irregular siliceo-spicular network. Dermis furnished with ternate connecting spicula. Ovaria membranous, aspiculous?

Type, *Normania crassa.*

The general structure of the skeleton of the type-specimen of this genus is very like that of Pachymatisma, but it is readily distinguished from that genus by the total absence of siliceous ovaria and by its thin and delicate dermal surface.

The radial structure of its skeleton near the surface of the sponge and its dermal connecting spicula bring it somewhat into alliance with Ecionemia, but the total absence of a central axial column readily distinguishes it from that genus.

I have named this genus after my friend the Rev. Alfred Merle Norman, an ardent and accomplished naturalist, to whom I am indebted for numerous new and valuable species of British sponges.

A genus *Normania* was established by Mr. G. S. Brady in 1866, for a section of *Crustacea copepoda* (vide 'Trans. Zool. Soc.,' vol. v, p. 382), but that title cannot be adopted, as the *Normania* of Brady is identical with *Loxoconcha* of G. O. Sars, which was founded a few months previously (vide G. O. Sars, 'Oversigt af Norges Marine Ostracoder,' 1865, p. 61, and G. S. Brady, 'Trans. Lin. Soc.,' vol. xxvi, 1868, p. 432).

Normania crassa, *Bowerbank.*

Plate LXXXI.

Sponge cupshaped, sessile? parietes stout and thick. Surfaces smooth, outer one minutely reticulated.

Oscula on inner surface, simple, variable in size, very numerous. Pores on outer surface, conspicuous, very numerous. Dermis thin, pellucid, outer surface furnished with a stout polyspiculous irregular reticulation; on the inner one with numerous dispersed tension spicula large and small; spicula subfusiformi-acerate; and also with numerous attenuato-stellate, and minute attenuato-elongo-stellate, retentive spicula. Connecting spicula expando-ternate, radii attenuated, very long; shafts very short. Skeleton. Fasciculi and reticulations stout and polyspiculous; rete open and irregular; spicula subfusiformi-acerate, long and large. Interstitial membranes. Pellucid, furnished abundantly with small subfusiformi-acerate tension spicula, and with numerous retentive spicula of the same form as those of the dermal membrane. Gemmules membranous, aspiculous.

Colour.—In the dried state, light grey.

Habitat.—Shetland, 110 fathoms; Rev. A. M. Norman.

Examined.—In the dried state.

The form of this sponge is that of an irregular compressed cup with very thick parietes; it has been torn from its natural attachment; the basal portion in its present state is three inches long by one inch in thickness, and it has every appearance of having been sessile.

The specimen under consideration is composed of two individuals united by approximation, and both present a marked disposition to the cupshaped form. The largest of the two is four and a quarter inches in length at its distal portion, and the smaller one slightly exceeds two inches. The breadth of the larger one does not exceed two inches, and the height of each is rather more than two inches. The margins of the cups are irregularly rounded. The general aspect of the surfaces of the sponge is strikingly characteristic; the beautiful minute reticulation of the outer or inhalent surface is strongly contrasted with the

smooth inner or exhalent one with its numerous oscular perforations.

Microscopically examined, the outer and inner membranes of the surfaces of the cup are in very strong contrast. The former is furnished with a stout polyspiculous reticulation, in the areas of which the pores are situated. The rete is remarkable in its structure; it appears to consist of primary and secondary lines; the first are stout polyspiculous bundles, sometimes running parallel to each other, but not always coinciding in their direction; the secondary lines are formed of single spicula of the same size and form, placed diagonally or at right angles to the primary fasciculi, or of groups of small tension spicula mixed with numerous retentive ones. In the exhalent surface we observe no such reticular structure; the whole surface is covered with an irregular mixture of large and small tension spicula, felted together as it were, amidst which innumerable stellate, retentive spicula are disposed.

The exhalent surface of the sponge abounds in large intermarginal cavities immediately beneath the dermis, and on their dermal surfaces there are a considerable number of connecting spicula with their triradiate heads firmly cemented to the inner surface of the membranes, and their shafts projecting into the cavities beneath.

The normal form of the connecting spicula is that of an expando-ternate one with a very short shaft, and greatly produced radii as represented in Plate LXXXI, fig. 5; but these are few in number compared with the abnormal forms, which are exceedingly variable, a few of which are represented by Figs. 6, 7, and 8 in the same plate.

This surface of the sponge presents a somewhat scattered hispidation, arising apparently from an irregular protrusion of the large dermal spicula through the dermal membranes; but it is very probable that in the living state this character would not be observable, nor does it appear on the inhalent surface of the

sponge. The porous surface of the sponge also exhibits numerous intermarginal cavities immediately beneath the dermal membrane, but they do not exhibit the large and cavernous appearance that we observe in those of the exhalent surface; nor do the connecting spicula appear to be nearly so numerous.

The oscula are exceedingly numerous towards the marginal portions of the inside of the cup; they are comparatively large and are dispersed at unequal distances from each other; towards the bottom of the cup they are minute and are congregated in considerable numbers above the large intermarginal spaces, the largest of the oscula rarely exceeding a line in diameter. The pores are comparatively speaking very large; there appears to be one only in each area of the dermal network. They are very numerous, appearing upon all parts of the outer or inhalent surface of the sponge.

The structure of the middle portions of the skeleton is that of a very open and diffused halichondroid network, the spicula being disposed in bundles of four or five, or singly, in various directions, forming large irregular angular areas. The mode of their disposition is different near the surfaces of the sponge. They are there collected in stout polyspiculous bundles, which pass inwards at very nearly right angles to the surface, and are connected with each other by widely spread interstitial membranes, crowded with small tension, and innumerable retentive spicula; as these bundles pass inward they merge in the central halichondroid portion of the skeleton.

The interstitial membranes are abundant and widely spread in the interstices of the sponge; they are frequently crossed by single large skeleton spicula, but their principal support is derived from a profusion of minute subfusiformi-acerate tension spicula, which cross each other in every possible direction.

With a power of five or six hundred linear these spicula exhibit a very incipient state of entire spination,

and the greater portion have a slight inflation near the middle of the shaft. The distinction in size between these spicula and those of the skeleton is very remarkable. The skeleton spicula of an average size is $\frac{1}{13}$ inch in length, and $\frac{1}{666}$ in diameter, while a medium-sized tension spiculum measured $\frac{1}{143}$ inch in length and $\frac{1}{5174}$ inch in diameter.

The retentive spicula are of two distinctly different sorts. The largest form are simple attenuato-stellate spicula, with but few long and slender radii, and they are three or four times as large as the smaller ones, which are almost all of them elongo-attenuato-stellate in form, and are very much more abundant than the larger ones.

A few gemmules were found amidst the skeleton tissues; they were of the usual halichondroid form, membranous and aspiculous.

In the course of my examination of a number of small sponges from 96 fathoms Shetland sent to me by Mr. Norman, I found one little packet containing five small specimens of a milk-white colour. The largest is one and a quarter inch in length, half an inch in width, and about two lines in thickness; they all prove to be young specimens of *Normania crassa* the smallest of them exhibiting the characteristic structural peculiarities of the species in perfection; the general arrangement of the skeleton, and every form of spiculum being as fully and completely developed as in the type-specimen of the genus. These little coating specimens of the sponge are strikingly illustrative of the futility of the characters of form and colour in the descriptions of sponges.

PLATE LXXXII.

Isodictya lurida, *Bowerbank*.

Vol. ii, p. 336, 'Mon. Brit. Spongiadæ.'

Fig. 1.—This specimen is a very much finer and more characteristic one than the type-specimen as quoted above.

Desmacidon copiosa, *Bowerbank*.

Fig. 2.—Represents the type-specimen of the species in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 3.—One of the large sub-clavate, acuate skeleton spicula. × 250 linear. This figure also represents the spicula of the dermal network.

Fig. 4.—A tricurvate, acerate, tension spiculum from the dermal membrane. × 530 linear.

Fig. 5.—One of the large contort, bihamate, retentive spicula of the dermal membrane. × 530 linear.

Fig. 6.—A dendato-inequi-palmate-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 7.—One of the bidentate-inequi-anchorate spicula from the dermal membrane. × 530 linear.

Fig. 8.—One of the slender subclavate, fusiformi-acuate tension spicula from the interstitial membranes. × 250 linear.

Desmacidon cavernula, *Bowerbank*.

Fig. 9.—Represents the type-specimen in the dried state. Natural size.

Fig. 10.—One of the tension spicula from the dermal membrane. × 250 linear.

Fig. 11.—A contort, bihamate retentive, spiculum from the dermal membrane. × 250 linear.

Fig. 12.—One of the fusiformi-acuate skeleton spicula. × 250 linear.

ECIONEMIA COACTURA, *Bowerbank*.

Fig. 13.—Represents the type-specimen in the cabinet of Mr. W. Saville Kent. Natural size.

Fig. 14.—A subfusiform, acerate, skeleton spiculum. × 80 linear. This figure also represents one of the large primary defensive spicula.

Fig. 15.—One of the slender fusiformi-acerate spicula of the secondary external defensive series. × 80 linear.

Fig. 16.—One of the large patento-ternate connecting spicula. × 80 linear.

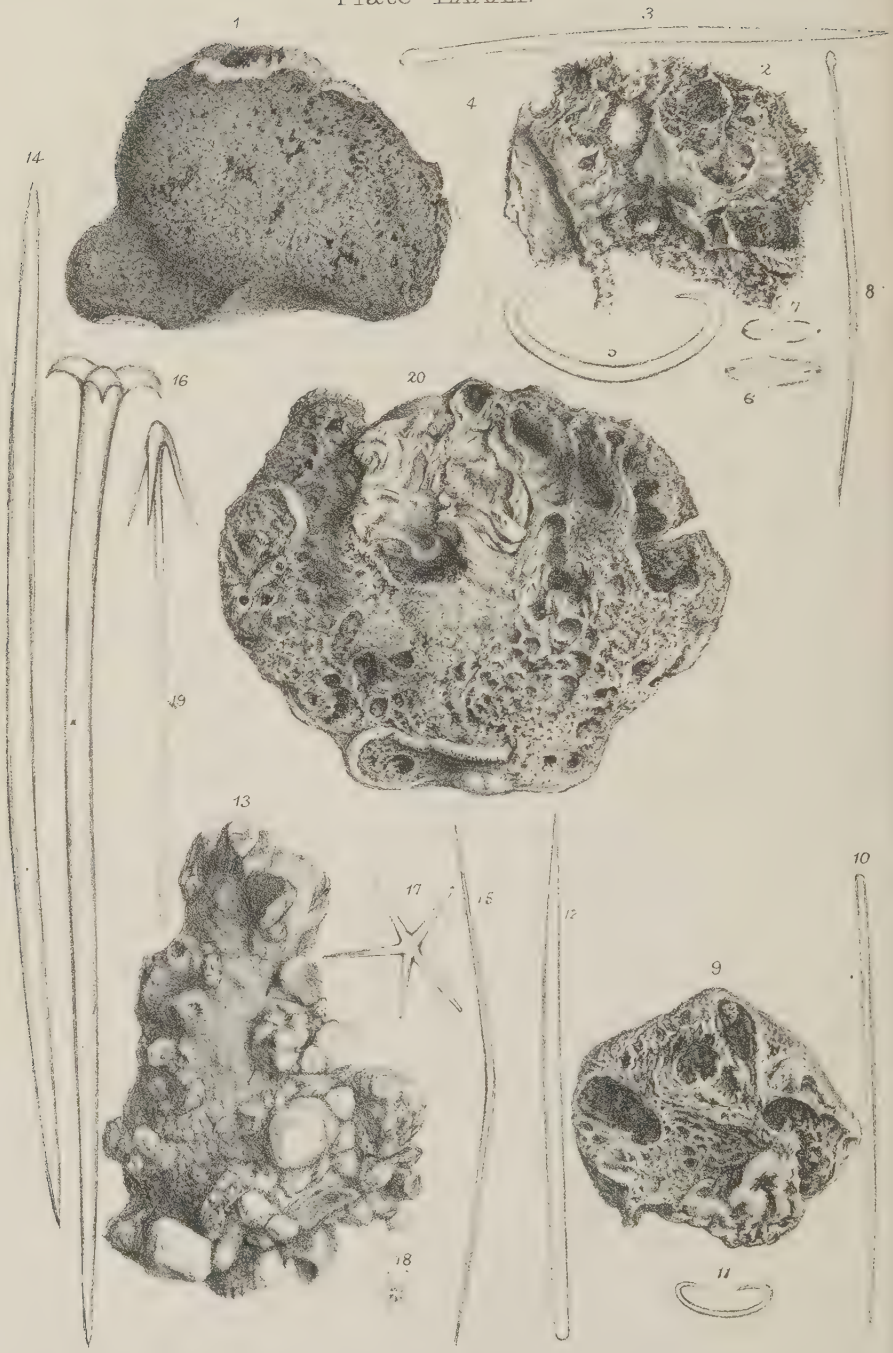
Fig. 17.—A large attenuato-stellate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 18.—One of the minute cylindro-stellate retentive spicula from the dermal membranes. × 530 linear.

Fig. 19.—A recurvo-ternate spiculum from the intermarginal cavities. × 80 linear. These spicula are of very rare occurrence, and their shafts are very long and slender.

Fig. 20.—Microciona fictitia.

Plate LXXXII.



Isodictya lurida 1. Desmacidon copiosa 2-8. D. cavernula 9-12.
Ecionemia coactura 13-19. Microciona fictitia 20.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATES XXIII and LXXXII.

Microciona fictitia, *Bowerbank.*

Vol. ii, p. 124, 'Mon. Brit. Spongiadæ.'

Since the figuring of the type-sponge from Guernsey sent to me by the Rev. A. M. Norman, I have acquired a very much more characteristic specimen of the species. It covers externally and internally a single deep valve of an old oyster shell, and the thickness of the sponge at some parts rather exceeds five lines, the dimensions of the shell being $2\frac{3}{4}$ by $2\frac{1}{2}$ inches. The sponge in its dried state is of a deep flesh-red colour. The surface of the sponge on both surfaces of the shell is exceedingly irregular and cavernous, some of these deep depressions being the eighth of an inch in diameter, and at the bottom of several of them there is a translucent oscular membrane. The dermal membrane exhibits the same pustulous character that is observable in the type-specimen, and the structural mode of the skeleton is much more in accordance with the general characters of the genus to which it belongs. The remainder of the structural and anatomical characters are identical with those of the type-specimen.

Desmacidon copiosa, *Bowerbank.*

Plate LXXXII.

Sponge sessile, coating. Surface rugged and uneven. Oscula simple, dispersed. Pores inconspicuous. Dermis subcrustaceous; dermal membrane pellucid, profusely spiculous; furnished with a stout irregular network, rete polyspiculous; areas abundantly supplied with spicula; tension spicula; tricurvate-acerate, small and slender, equi-curvate, rather numerous; retentive spicula, simple contort and reversed bihamate, very numerous and rarely biumbonate bihamate, large and

stout; also inequi-dentato-palmate anchorate, and bidentate inequi-anchorate, both forms very minute and few in number, dispersed. Skeleton. Irregular and very open; fibre stout; spicula sub-clavate, fusiformi-acuate; stout and very fusiform; areas large and profusely spiculous; tension spicula subclavate fusiformi-acuate, long and slender, exceedingly numerous and closely matted together; also tricurvate acerate, small and slender, few in number; retentive spicula the same as in the dermal membrane, but more copiously distributed. Gemmules membranous, aspiculous.

Colour.—In the dried state, cream white.

Habitat.—Jersey, Rev. A. M. Norman, 1859; Mr. Nichols, Jersey, 1851.

Examined.—In the dried state.

The type-specimen of this species is an irregular mass rather less than two inches in average diameter. It has apparently been based on the solid rock, as small branches of *Corallina officinalis* are intermingled with its structure; the greatest thickness does not exceed half an inch. The surface is exceedingly irregular and rugged, and where the dermis is in good preservation it closely resembles thin cream-coloured kid leather. This crustaceous appearance arises from the exceeding abundance of its various spicula combined with the stout polyspiculous network of the dermal membrane in the interstices of which numerous large open pores were apparent. It is rather remarkable that scarcely a single specimen of the long slender subclavate, fusiformi-acuate tension spicula, which are found in such profusion in the interstitial membranes, could be detected in the portions of the dermal membrane that were submitted to examination; while the tricurvate, acerate tension spicula were very much more abundant in the dermal membrane than in the interstitial ones. The minute retentive spicula were about equally distributed in the two descriptions of membrane. The interstitial spaces in the sponge are very large, and their membranes proportionally expanded; the whole of

their surfaces are profusely furnished with spicula, especially with the long slender subclavate fusiformi-acuate tension spicula, which in some parts are so numerous and so closely felted together as to nearly render the membrane opaque and to totally obscure the more delicately formed retentive spicula. The skeleton fibre is strongly and compactly produced. The spicula of which it is composed might at the first glance be mistaken for those of *Desmacidon constrictus;* there is an approximation to the constricted form of their cases like the skeleton spicula of that species, but the constriction is productive rather of a slight clavation of the base than of the elongated constriction so remarkable in the spicula in *D. constrictus*. There is another character that serves at once to discriminate the two species, and that is, that the spicula of *D. copiosa* are very nearly of the same diameter, but not more than half the length of those of *D. constrictus*. The subclavate, fusiformi-acuate tension spicula of the interstitial membranes are as long as those of the skeleton, but not more than one fifth or one sixth of their diameter. The bihamate retentive spicula are large and stout, and occasionally we find a well-produced symmetrical inflation at the middle of the shaft; they are exceedingly numerous in both the dermal and interstitial membranes. The inequi-dentato-palmate ones are very few in number as compared with the bidentate inequi-anchorate ones; both forms are very minute and require a power of five or six hundred linear to distinctly define their forms.

The number of the varieties in the forms of the spicula, not less than seven, and the profusion in which they are supplied to the tissues renders this species a very remarkable and instructive one.

Since Mr. Norman's specimen was drawn on stone I have found among my store of unexamined specimens a much finer one than that which has been figured. It is two and a half inches in height, two in breadth, and one and a quarter inch thick. In its external characters

and its anatomical details it is in perfect accordance with the type-specimen.

Desmacidon cavernula, *Bowerbank.*

Plate LXXXII.

Sponge massive, irregular; interior cavernous, with large external orifices; surface uneven and very rugged. Oscula simple; few external, the greater part internal. Pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula either dispersed or forming an irregular reticulation, acuate, nearly as large as those of the skeleton; retentive spicula contort, bihamate, rather stout, few in number. Skeleton fibre stout and compact; spicula fusiformi-acuate. Interstitial membranes spiculous; tension and retentive spicula same as those of the dermal membrane, dispersed; retentive spicula few in number.

Colour.—In the dried state, dark brown.

Habitat.—Haaf banks, Shetland, Mr. Humphreys.

Examined.—In the dried state.

I received this sponge with other species from the fishermen at the Haaf banks, Shetland, through their agent Mr. Humphreys many years since, and it escaped my observation until very lately, when I found it among my numerous duplicates. Its form is that of an irregularly compressed mass. Its greatest breadth is one inch and a half and its average thickness about three fourths of an inch. There is no appearance of a basal attachment. The interior is one large irregular cavern into which there are six openings, one of them being eight lines in breadth and three in height. The cavernous interior is covered with a dermal membrane like that of the exterior surface, which is inflected through all the great openings into the interior, and its surface characters within the sponge are precisely the same as those of the external dermal membrane.

The interior space is very rugged and uneven, with numerous irregular conical projections.

There are a few simple oscula on the exterior of the sponge, but they appear to be very much more numerous on the inner surface, which seems to exercise the function of a large irregular cloaca, receiving the oscular excurrent streams and discharging its fæcal contents through the great openings on the surface.

On the greater portion of the dermal membrane the tension spicula form a distinct but irregular reticulation, which is visible in the dried specimen by the aid of a lens of about two inches focus; but in other parts the tension spicula are irregularly and thickly dispersed on its surface; their form is more purely acuate than those of the skeleton. There is little danger of confounding this species with either *D. constrictus* or *D. Peachii*, the comparative size of its skeleton spicula alone sufficing to distinguish it, as they are only about half the size of those of the former species and not more than about one third the length of those of the latter one; and the comparatively short, stout, retentive spicula of *D. cavernula* are in strong contrast with the large but delicately slender ones of *D. Peachii*.

Ecionemia coactura, *Bowerbank*.

Plate LXXXII.

Sponge massive, unattached, collecting on its surface numerous small pebbles and other extraneous matters. Surface even, minutely granulated, and occasionally hispid. Oscula and pores inconspicuous. Dermis. Primary external defensive spicula subfusiformi-acerate, long and stout; secondary external defensive spicula fusiformi-acerate, long and very slender; terminations exceedingly attenuated, few in number. Dermal membrane thin and pellucid; pores numerous and large, congregated in the areas between the groups of terminal heads of the connecting spicula. Dermal membrane

abundantly furnished with comparatively large attenuato-stellate retentive spicula; radii few in number and with minute cylindro-stellate spicula with numerous radii. Connecting spicula attenuato-patento-ternate, very large and long; radii short and stout, sub-geniculate: projecting in large expanding fasciculi to the dermal surface where their apices are corymbose. Skeleton spicula sub-fusiformi acerate, long and stout. Interstitial membranes abundantly furnished with the same forms of retentive spicula as those of the dermal membrane, and also with a few large doliolate spicula.

Colour.—In spirit, light green.

Habitat.—Off Guernsey; Mr. W. Saville Kent.

Examined.—As it came from the sea, in spirit.

This remarkable sponge was obtained off Guernsey by Mr. W. Saville Kent, during his dredging expedition with Mr. Marshall Hall in his yacht Norna in 1870. It is rudely conical in form, two and a half inches high, and a half inch in diameter at the base of the cone, and half an inch at its apex. There is no trace of any former attachment, and it has every appearance of having been rolled about freely on the bottom of the sea. It has attached to all parts of its surface numerous small pebbles and two univalve shells; twenty of these are about the size of peas and a great many more smaller ones. It is firm and very incompressible, and is of a light green tint of colour. Where the surface is free from extraneous matters it has in its present state, preserved in spirit, a finely granulated appearance and feels rough to the touch, in consequence of the projection of the heads of the ternate connecting and large external defensive spicula. On some parts of the surface protected by the attached pebbles, by the aid of a two-inch lens, there are indications of minute hispidation by the projection of the large external defensive spicula, which are of the same size and form as those of the skeleton, but this indication was very partial. I could not detect the oscula even by the assistance of a lens.

In a small slice from the surface of the sponge, mounted in Canada balsam, the pores were distinctly and beautifully exhibited in the spaces between the heads of the groups of the ternate connecting spicula. They were in an open condition and were comparatively of large size. The dermal surface is remarkably dense and strong in consequence of the abundance of the closely packed and numerous corymbose fasciculi of the connecting spicula, the terminal heads of which serve to a great extent as external defences. Amidst these fasciculi large skeleton spicula are rather sparingly projected for about half their length, forming the primary external defensive system, and amidst these the long and slender secondary defensive spicula are projected; they are not very abundant, but much more so than those of the primary system. The dermal membrane is profusely furnished with two forms of stellate, retentive spicula. The first one is attenuato-stellate with their radii few in number, long and very acutely terminated, and they are four or five times the diameter of the smaller series, which are very minute cylindro-stellate forms with numerous radii. They are indiscriminately mixed and dispersed, the smaller ones being very much the most numerous.

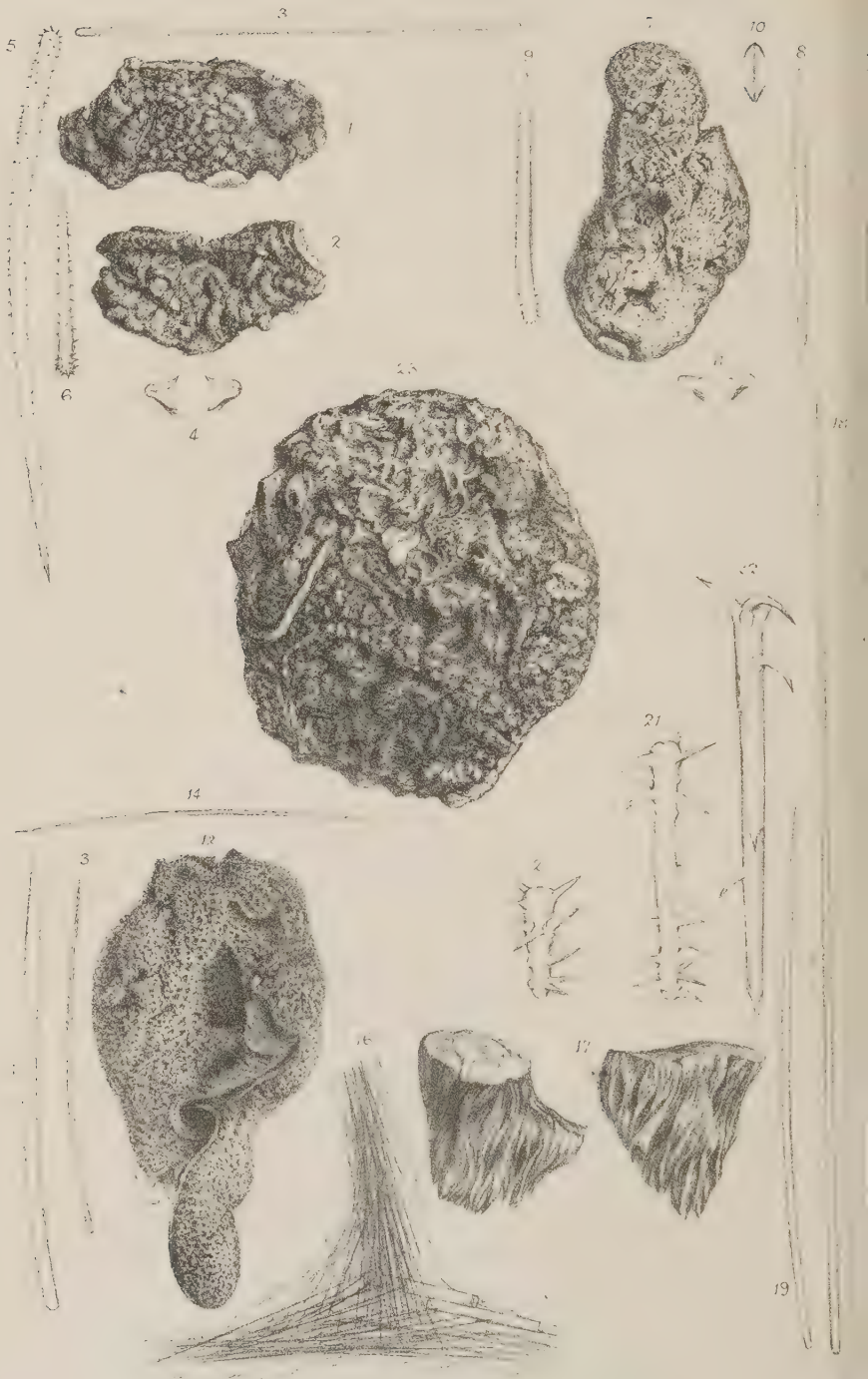
The connecting spicula are remarkable by their great number as well as by their form. They are large and stout with very short radii, which in the adult state are bent suddenly downwards near their distal terminations. They are disposed at the surface of the sponge in large closely packed fasciculi; their bases are closely pressed together, their shafts radiating to such an extent as to bring all their distal terminations into the corymbose form.

The interstitial membranes are furnished abundantly with the same forms of retentive spicula as those of the dermal membrane. The doliolate spicula are large and few in number.

The habit of collecting such a profusion of small pebbles and other extraneous matters on its surface to

protect it from attrition while freely rolling about is a very remarkable character, and should it prove to be a constant one will always readily distinguish the species from its congeners.

Plate LXXXIII.



Microciona jecusculum 1–6. M. fraudator 7–11. Chalina inornata 12
Tethea spinosa 17–22. Desmacidon aegagropila 23.

W. Lens Aldous del. et lith.

W West & Co imp

PLATE LXXXIII.

Microciona jecusculum, *Bowerbank.*

Figs. 1 and 2.—Represent the type-specimens from the Island of Harris, in the dried state. Natural size.

Fig. 3.—One of the slender acuate spicula from the dermal membrane. × 250 linear. This figure will also represent the external defensive spicula.

Fig. 4.—One of the stout angulated, equi-anchorate, retentive spicula from the dermal membrane. × 530 linear.

Fig. 5.—An attenuato-acuate basally spined skeleton spiculum. × 250 linear.

Fig. 6.—An attenuato-acuate, entirely spined, internal defensive spiculum. × 250 linear.

Microciona fraudator, *Bowerbank.*

Fig. 7.—Represents the type-specimen in the dried state. Natural size.

Fig. 8.—One of the skeleton spicula. × 250 linear. This figure will also represent the tension spicula of the dermal membrane.

Fig. 9.—An attenuato-acuate, internal defensive spiculum. × 250 linear.

Figs. 10 and 11.—Two of the bidentate, equi-anchorate, retentive spicula from the dermal membrane. × 530 linear.

Chalina inornata, *Bowerbank.*

Fig. 12.—Represents the type-specimen in the dried state. Natural size.

Fig. 13.—One of the small subfusiformi-acuate skeleton spicula. × 320 linear. These spicula vary to a considerable extent in their size. The same figure also represents the tension spicula of the dermal membrane.

Fig. 14.—One of the acerate spicula that are occasionally found amongst the others. × 320 linear.

Fig. 15—One of the large acuate skeleton spicula of comparatively rare occurrence. × 320 linear.

Fig. 16.—Represents a small piece of the skeleton fibre, exhibiting the numerous spicula *in sitú*. × 150 linear.

Tethea spinosa, *Bowerbank.*

Fig. 17.—Represents the two fragments of the type-specimen of the species from Fowey Harbour. Natural size.

Fig. 18.—A skeleton spiculum from the radial fasciculi of the sponge. × 80 linear.

Fig. 19.—One of the tension spicula from the dermal membrane. × 80 linear. These spicula vary to a considerable extent in length, frequently equalling those of the skeleton fasciculi.

Figs. 20, 21, and 22.—Three of the external defensive and retentive spicula. × 530 linear. No two of these spicula have the same form or mode of disposition of the spines.

Desmacidon ægagropila, *Bowerbank.*

Vol. ii, p. 352, 'Mon. Brit. Spongiadæ;' iii, pl. lxiii, figs. 8—14.

Microciona jecusculum, *Bowerbank.*

Plate LXXXIII.

Hymeniacidon jecusculum, Bowerbank. Vol. ii, p. 198, 'Mon. Brit. Spongiadæ.'

A re-examination of the type-specimens of this sponge

has satisfied me that I was in error in describing it as a Hymeniacidon. It, therefore, becomes necessary to add slightly to the specific description of the sponge described as a Hymeniacidon, and the following will be its description as a Microciona.

Sponge coating, surface corrugated, slightly hispid. Oscula simple, dispersed: submarginated, slightly fringed. Pores inconspicuous. Dermal membrane pellucid, abundantly spiculous; spicula acuate, long and slender; inner surface furnished with numerous stout angulated, equi-anchorate, retentive spicula. Skeleton. Columns long; slender, and flexuous, occasionally branching: spicula attenuato-acuate, basally spined, long and stout, occasionally subclavate; spines rather stout and small. Internal defensive spicula attenuato-acuate, entirely spined; short, occasionally subclavate; spines large and long. External defensive spicula acuate, like those of the dermal membrane. Spicula of interstitial membranes acerate, long and slender, sometimes flexuous, numerous. Retentive spicula angulated, bidentate, equi-anchorate, rarely tridentate, large and stout, exceedingly numerous.

For the general description of the sponge I must refer the reader to vol ii, page 198, 'Mon. Brit. Spongiadæ.'

Microciona fraudator, *Bowerbank.*

Plate LXXXIII.

Sponge massive, sessile, parasitical on fuci, or zoophytes, surface uneven, pustulous. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula same as those of the skeleton, irregularly fasciculated or dispersed; fasciculi broad and flat, multispiculous; retentive spicula bidentate equi-anchorate, minute, not very numerous. Skeleton, columns diffuse, long and very irregular; spicula fusiformi-acerate, short and stout. Internal defensive spicula attenuato-acuate, variable

in length, very numerous, rather short, entirely spined; spines large and strong. Interstitial membranes abundantly spiculous; tension spicula same as those of the skeleton, intermixed with internal defensive spicula; retentive spicula same as those of the dermal membrane.

Colour.—Dried, brown, with a tint of yellow.

Habitat.—Polperro; Mr. Jonathan Couch. Fowey Harbour; Mr. C. W. Peach.

Examined.—In the dried state.

This sponge, for which I am indebted to Mr. Couch, is an elongately ovoid mass one and three quarters of an inch in length and nearly an inch at its greatest diameter. It has apparently been parasitical on a fucus or zoophyte, the remains of which are to be seen at the largest end. The surface is pustulous, the elevations are usually flat at their apices; occasionally an osculum appears on their summits; but more frequently these organs are situated in the spaces between them.

In these external characters this species very closely resembles *M. fictitia*, and its internal organs are also in form nearly like those of that species; but although thus far agreeing in form their proportions are so distinctly different as to render their separation as species in a perfectly satisfactory manner. The dermal membranes of both species are about equally abundantly supplied with tension spicula, and they also agree very closely in their mode of disposition; but in the proportions of their length and diameter they vary exceedingly, the spicula of *M. fraudator* not being more than half the length of those of *M. fictitia*, while they are quite equal to them in diameter. The form of those of the latter species are purely acerate, while in the former they are distinctly fusiformi-acuate. Similar differences exist in the retentive spicula of the dermal and interstitial membranes of the respective species; those of *M. fictitia* being at least twice as stout as those of *M. fraudator*.

The like discrepancies also obtain in their internal

defensive spicula; those of *M. fraudator* being much stouter, and their spination very much more strongly produced, than in *M. fictitia*.

The differences in the forms of the skeleton spicula are sufficiently marked by those of *M. fictitia* being purely acerate, long and slender, while those of *M. fraudator* are stout and fusiformi-acerate; the latter are not more than half the length of the former. It is essentially necessary in the discrimination of the two species that these differential characters should be carefully noted, as the general structure and the habits of the two are so much alike; and especially as the singular habit described in the history of *M. fictitia* of the spreading of the distal terminations of the skeleton columns on the inner surface of the dermal membrane obtains in both species.

I have also received a specimen of this species from Mr. C. W. Peach, who found it in Fowey Harbour. The sponge is not perfect. It is well represented by the lower half of the figured specimen, but the diameter is somewhat greater and there is a hole through it in a longitudinal direction, indicating that, like the figured specimen, it has grown surrounding the stem of a fucus.

Chalina inornata, *Bowerbank*.

Plate LXXXIII.

Sponge massive, sessile. Surface uneven. Oscula and pores unknown. Dermal membrane sparingly spiculous; spicula acuate, small and slender; rarely the same form large and stout. Skeleton. Rete rather coarse and open, irregular, abundantly spiculous, spicula subfusiformi-acuate, very rarely acerate, small and slender, numerous; and the same form large and long, few in number, near the circumference of the fibre. Interstitial membranes sparingly spiculous; spicula same as those of the dermal membrane.

Colour.—Nutbrown in the dried state.

Habitat.—Parasitical on stems of large fuci, Mounts Bay, Cornwall; J. S. Bowerbank.

Examined.—In the dried state.

The sponge coats, irregularly and thickly, the remains of the stem of a large fucus. It is two and a quarter inches long and one and a quarter broad, and has several branches of *Plumularia pennatula* growing through its substance. Unfortunately it has suffered so much by maceration that the external characters are very nearly obliterated. The dermal membrane is nearly entirely gone, small portions only remain; these fragments are sparingly furnished with the smaller description of acuate spicula, with an occasional intermixture of the larger and stouter ones. The position of the oscula are indicated by a few large orifices in the substance of the surface of the sponge. No trace of pores could be detected on any of the fragments of the dermal membrane. The external form of the sponge is exceedingly irregular and unprepossessing, but the internal characters are amply sufficient to determine the species.

The skeleton is remarkable in its structure, the fibre is furnished abundantly with spicula disposed in a central line; these spicula are small and slender, and are much too numerous and too closely packed together to be counted, and it is only occasionally near the outer portion of the fibre that the large and comparatively long spicula of the skeleton are found disposed singly; and it is rarely that they are found intermixed with the central line of slender spicula. This mode of structure is very singular, and I do not remember to have observed it before in any species of chalina. It therefore forms a very prominent character in the discrimination of the species.

The respective differences of the two sizes of spicula in *C. inornata* as compared with each other may be best expressed by their average measurements. Thus the larger ones were $\frac{1}{150}$ inch long and greatest diameter $\frac{1}{3225}$ inch; while the smaller ones were $\frac{1}{214}$ inch long and their greatest diameter $\frac{1}{9375}$ inch.

Tethea spinosa, *Bowerbank.*

Plate LXXXIII.

Sponge massive, round or oval, sessile. Surface smooth and even. Oscula and pores inconspicuous. Dermal membrane thin, pellucid, abundantly spiculous; tension spicula acuate, as long as those of the skeleton, but more slender, abundant, irregularly disposed; external defensive and retentive spicula attenuato-cylindrical rarely or acuate, variable in size and form, strongly spinous; spines acute, few in number, irregularly disposed, frequently longer than the greatest diameter of the spiculum. Skeleton. Fasciculi multispiculate, spicula acuate, long and slender. Interstitial membrane sparingly spiculous; spicula same as those of the dermal membrane. Internal defensive spicula the same as the external defensive ones.

Colour.—In the dried state, light ochreous yellow.

Habitat.—Fowey Harbour, Mr. C. W. Peach.

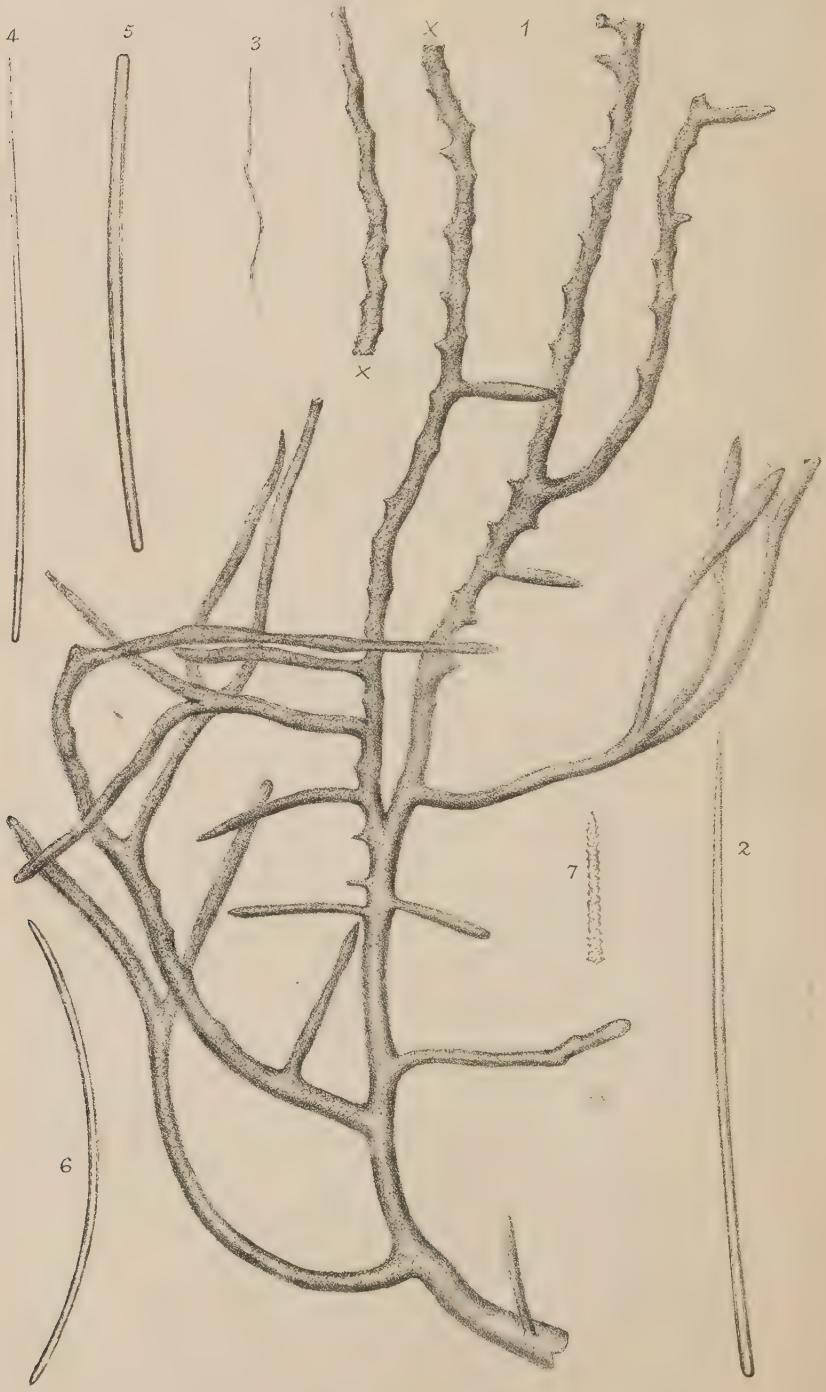
Examined.—In the dried state.

I am indebted to my kind friend Mr. C. W. Peach for the two fragments of the sponge which are figured; they are the only specimens of the species with which I am acquainted. From the direction of the converging fasciculi of the skeleton from the external surface inwards, in both the fragments, they have the appearance of having belonged to a spherical or oval mass rather exceeding two inches in diameter, and the curvature of what remains of the dermal surface is in favour of the same idea; and as the prevailing form of the other known species of Tethea are in accordance with similar shapes, I have taken the characters of form in this species as granted; but whether this supposition be correct, or the contrary, is of very little importance, as the structural characters are so distinctly different from those of any other known species of Tethea, that a careful examination of them cannot well fail of leading the student to a correct discrimination of the species.

To the unassisted eye the surface of the sponge appears quite smooth, nor even when portions of it are mounted in Canada balsam, and examined with a power of 100 linear, are there any projecting spicula visible. When thus examined the numerous long, slender acuate tension spicula are seen crossing each other in every possible direction in the same plane, and in their irregular interstices there are numerous external defensive and retentive attenuato-cylindrical spinous spicula in a recumbent position. No two of them are precisely alike in form and size, and the variation in the size and disposition of the spines upon them is equally remarkable; they are slender and acutely terminated, and are frequently twice the length of the diameter of that part of the spiculum whence they spring. Occasionally the distal extremity of the spiculum terminates with one of these large spines, and the spiculum then assumes the attenuato-acuate form. These remarkable spicula constitute the prominent character of the species and when separated by boiling nitric acid and mounted in Canada balsam they require a power of about 200 linear to render their peculiarities of structure distinctly to the eye. When a thin section of the sponge at right angles to the dermal surface is mounted in Canada balsam, their position amid the tissues is different from what it is when attached to the dermal membrane; there they appear always to be recumbent, performing the offices of both retentive and defensive spicula, but within the interstices of the skeleton they are almost always projected at nearly right angles from the sides of the skeleton fasciculi, and in this position they are purely internal defenses; occasionally, but very rarely, a recumbent one may be observed on the interstitial membranes; these spicula and the long slender tension spicula so abundant on the dermal membrane are both of comparatively rare occurrence in the interstitial ones.

I could not detect any other form of spiculum in the sponge than those which I have described.

Plate LXXXIV.



Dictyo cylindrus rectangulus.

Lens Aldous del. et lith.

W. West & Co. imp.

PLATE LXXXIV.

DICTYOCYLINDRUS RECTANGULUS, *Bowerbank.*

Fig. 1—Represents the type-specimen in the cabinet of the Rev. A. M. Norman of the natural size. The detached piece near the top of the plate with the × at its base is a continuation of the main stem of the sponge from the spot at the top indicated by a corresponding mark.

Fig. 2.—One of the large acuate external defensive spicula. × 80 linear.

Fig. 3.—One of the long and very slender acuate tension spicula of the dermal membrane. × 80 linear.

Fig. 4.—An average-sized acuate spiculum from the axial skeleton of the sponge; occasionally they attain the size of the external defensive ones represented by figure 2. × 80 linear.

Fig. 5.—A cylindrical skeleton spiculum. × 80 linear.

Fig. 6.—An acerate skeleton spiculum. × 80 linear. The spicula represented by figures 5 and 6 are of comparatively rare occurrence.

Fig. 7.—One of the entirely spined, attenuato-acuate, internal defensive spicula. × 250 linear.

DICTYOCYLINDRUS RECTANGULUS, *Bowerbank.*

Plate LXXXIV.

Sponge ramous, slender; branches regularly cylindrical; primary branches dividing dichotomously or trichotomously; secondary branches at right angles to the primary ones; surface hispid. External defensive

Plate LXXXV.

Isodictya filamenta 1–4. I. luteosa 5–7. I. invalida 8–10.
Hymeniacidon medius 11–13. Desmacidon incognitus 14–16.

W. Lens Aldous. del. et lith.

W. West & Co imp.

PLATE LXXXV.

Isodictya filamenta, *Bowerbank.*

Fig. 1.—Represents the sponge, mounted in Canada balsam. Natural size.

Fig. 2.—A portion of the sponge at about (a figure 1) × 80 linear.

Fig. 3.—One of the slender acerate spicula from the dermal membrane. × 250 linear.

Fig. 4.—An average-sized skeleton spiculum. × 250 linear.

Isodictya luteosa, *Bowerbank.*

Fig. 5.—Represents the type-specimen of the species. Natural size.

Fig. 6.—One of the skeleton spicula. × 250 linear.

Fig. 7.—A tension spiculum from the interstitial membrane. × 250 linear.

Isodictya invalida, *Bowerbank.*

Fig. 8.—Represents the type-specimen. Natural size.

Fig. 9.—An average-sized skeleton spiculum. × 250 linear. These spicula vary considerably in their length.

Fig. 10.—An acerate spiculum from the skeleton. × 250 linear. This form of spiculum occurs very rarely among the normal acuate ones.

HYMENIACIDON MEDIUS, *Bowerbank.*

Fig. 11.—Represents the type-specimen based on a rolled pebble. Natural size.

Fig. 12.—An average-sized acuate skeleton spiculum. × 250 linear.

Fig. 13.—One of the tension spicula of the dermal membrane. × 250 linear.

DESMACIDON INCOGNITUS, *Bowerbank.*

Fig. 14.—Represents the type-specimen. Natural size.

Fig. 15.—An average-sized, acuate, skeleton spiculum. × 250 linear.

Fig. 16.—One of the tension spicula of the dermal membrane. × 250 linear.

ISODICTYA FILAMENTA, *Bowerbank.*

Plate LXXXV.

Sponge. Branching, ascending from a slightly expanded base. Surface smooth. Oscula and pores inconspicuous. Dermal membrane spiculous; spicula acerate, rather slender, very numerous, dispersed or subfasciculated. Skeleton, Primary lines radiating from the base of the sponge upwards; bi- or tri-spiculous; secondary lines uni-spiculous; rete rarely more than one spiculum wide. Sarcode abundant.

Colour.—In the dried state, dark green.

Habitat.—Shetland; Mr. C. W. Peach.

Examined.—In the dried state.

This interesting little species was dredged at Shetland in 1866 by Mr. Peach. It had grown on a fragment of a dead shell 9 lines in length by 4 lines in width. The sponge is 5 lines in height, and does not exceed an ordinary sewing thread in thickness, and it

springs from a thin base not exceeding a line in length and about half a line in width. When examined in water the whole of the sponge was nearly opaque, and it was not until it was mounted in Canada balsam that its structural character could be determined.

It is nearly of the same diameter from its base to its apex. There are no indications of hispidation on any part of either the base or the ascending portion of the sponge. The dermal membrane closely invests the sponge for about two thirds of its length upwards from the base; but that portion of the column is so opaque that the spiculation of its dermal membrane is but very indistinctly to be seen; but at a portion of the thin margin of the base its characters were distinctly demonstrable; and the spicula were there seen to be closely packed together either in broad parallel groups or irregularly dispersed. They are of the same form as those of the skeleton, but rather less in length and diameter.

At a few small spots on the column they were also rather indistinctly visible, and they appeared to be there disposed in parallel groups in lines coinciding with the long axis of the sponge. The primary lines of the skeleton vary from two to three or four spicula in thickness, and they all run parallel to each other in accordance with the long axis of the sponge. The secondary lines of the skeleton appear all to be unispiculous, and the interstices of the rete are most frequently square.

From the general appearance of the structures of the sponge, it appears to be in an adult state, and if the specimen under consideration be of its usual size it will be readily distinguished from its nearest allies in the group of species to which it belongs. There are only two species with which it is likely to be confounded—*Isodictya ramusculus* and *I. clava*.

The former has the skeleton spicula shorter but much stouter than those of *I. filamenta*, and it differs also in the unispiculous structure of the skeleton. In

the latter the spicula closely resemble those of *I. filamenta*, but the open arrangement of the rete of the skeleton and the hispid surface of the sponge will readily distinguish it from the species under description.

Isodictya luteosa, *Bowerbank.*

Plate LXXXV.

Sponge parasitical on small fuci. Surface smooth, but somewhat corrugated. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane aspiculous, abundantly minutely granulated; granules pellucid, evenly and very closely disposed. Skeleton. Very irregular; primary lines multispiculous, tortuous; secondary lines very irregularly disposed; varying from unispiculous to multispiculous. Spicula acerate, small and short. Interstitial membranes sparingly spiculous; spicula of the same form as those of the skeleton, but shorter and more delicate in form.

Colour.—Slate-grey or mud colour.

Habitat.—Portaferry, Strangford Lough; Rev. A. M. Norman.

Examined.—In the dried state.

This is certainly the most unprepossessing sponge that I have ever examined. In its external character it very closely resembles an elongate mass of the fibrous stems of a small fucus cemented together by dried mud.

Although thus repulsive in its outward appearance, its internal structures are in an excellent state of preservation, but in a most puzzling condition for examination. At the first view, with a low power, at a thin slice mounted in Canada balsam, it has much of the aspect of a very irregular Hymeniacidon, but a closer acquaintance with its skeleton with higher powers reveals unmistakably its character as an Isodictya.

The primary lines of the skeleton near the dermal

surface, where they are usually in the most regular condition, are exceedingly irregular and tortuous in their course, and towards the inner portion of the sponge they may be seen assuming every possible direction. The secondary lines connecting the primary ones with each other partake of the same irregularity; sometimes, but rarely, they are more or less multispiculous, but the more usual mode of their disposition is in single spicula closely adjoining each other, and frequently at different angles; and they are so numerous as to greatly complicate and confuse the structures.

The spicula of the primary lines are rather larger and stouter than those of the secondary ones. An average-sized one from the primary lines measured $\frac{1}{237}$ inch in length, with greatest diameter $\frac{1}{5000}$ inch, and the largest spiculum I could find measured $\frac{1}{187}$ inch in length.

The dermal membrane, although aspiculous, affords the most distinctive character of the species when mounted in Canada balsam, and viewed with a power of about 400 linear. It is then seen to be abundantly supplied with minute pellucid granules, uniform in their form and size, and closely packed together; but it must be remembered that they are visible only when the membrane is mounted in Canada balsam.

Isodictya invalida, *Bowerbank.*

Plate LXXXV.

Sponge parasitical on slender zoophytes, &c. Surface smooth and even. Oscula simple, dispersed, minute. Pores inconspicuous. Dermal membrane thin, pellucid, aspiculous. Skeleton.—Rete very open, and cavernulous; primary lines in accordance with the long axes of the sponge, multispiculous, very tortuous; secondary lines varying from unispiculous to multispiculous, irregularly disposed; spicula acuate, small

and slender. Interstitial membranes thin and delicate, aspiculous.

Colour.—In the dried state, light gray.

Habitat.—Plymouth; Mr. C. Stewart.

Examined.—In the dried state.

I am indebted to my friend the Rev. A. M. Norman, for my knowledge of this species which he obtained, with other sponges from Plymouth, of Mr. C. Stewart.

This sponge covers and closely embraces the stems of a slender zoophyte for two and a quarter inches of its length. It does not envelop the whole into one mass; but it assumes the form of a branching sponge, the branches being about three lines in diameter with two or three smaller ones thrown off laterally. It is extremely tender and fragile in structure. The primary lines of the skeleton run in the direction of the long axes of the sponge, and this is their normal course in a branching species; in other species of Isodictya, where the habit is more decidedly parasitical, they are often based on the body on which they are located and their direction is then from the centre to the circumference of the mass; so that it would appear that the sponge under consideration was normally a branching species. Very few of the oscula could be detected in consequence of nearly the whole of the dermal membrane being absent. The few patches of the dermal membrane remaining were thin and pellucid and apparently aspiculous. The skeleton rete is very open and cavernulous. The primary lines, rather distant from each other, meander in a very tortuous mode in a longitudinal direction, and this necessarily produces great irregularity in the disposition of the secondary lines of the skeleton, but although irregular to this extent, the normal structural peculiarities of an Isodictya are unmistakably apparent. The spicula of the primary lines of the skeleton are rather larger and stouter than those of the secondary ones; but the whole of them are small and very slender. One of the largest of them measured $\frac{1}{136}$ inch in

length and $\frac{1}{6000}$ in diameter. The interstitial membranes are very thin and pellucid.

This sponge is not a very attractive species, but it is interesting from the irregularity and singularity of its structure.

I subsequently found among the sponges sent to me by the Rev. A. M. Norman another specimen of this species. It presents the same branching habit as the one first described, and, like it, is parasitical on the slender stems of a small zoophyte combined with branches of *Saliconaria farciminoides*. The surface of this specimen appears to be in a rather better condition than that of the first one, and a greater number of oscula are seen dispersed on its surface. Internally the structures of the two specimens are in perfect accordance.

Hymeniacidon medius, *Bowerbank*.

Plate LXXXV.

Sponge sessile, massive. Surface smooth, but slightly corrugated. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, abundantly spiculous; spicula acuate, or sub-fusiformi acuate, slender, rather less than those of the skeleton, closely and irregularly felted together. Skeleton cavernulous; spicula sub-fusiformi acuate, long, and slender.

Colour.—In the dry state, ochreous yellow.

Habitat.—Plymouth; Mr. C. Stewart.

Examined.—In the dried state.

This sponge was found at Plymouth by Mr. C. Stewart, and was presented by him to my friend the Rev. A. M. Norman. It is based upon three small bouldered pebbles, which it has cemented together. It is of extremely simple structure; it contains but one form of spiculum. Its nearest allies are *Hymeniacidon mammeata* on the one side, and *H. plumiger* on the other; but it differs from the former in the total absence of the mammæ-form projections on its surface,

and in the size and proportion of its skeleton spicula. The two species have the same open, cavernulous, skeleton structure and the same form of the spicula, but their size and proportions vary to a considerable extent. Those of *H. medius* being much more slender, and a fully developed one measured but $\frac{1}{67}$ inch in length, while a fully developed one of *H. mammeata* measured $\frac{1}{46}$ inch in length, and the diameter was increased proportionally.

The comparison with *H. plumiger* was the reverse of that with *H. mammeata*. The spicula of *H. plumiger* are purely acuate, and one of the largest measured but $\frac{1}{100}$ inch in length, and the skeleton structure is not nearly so cavernulous, and is very much more delicate in its construction. The two species also differ materially in the characters of their dermal membranes.

There is no other British species of Hymeniacidon with which the species under consideration is likely to be confounded.

Desmacidon incognitus, *Bowerbank.*

Plate LXXXV.

Sponge: a fragment only. Surface rough and open. Oscula unknown. Pores inconspicuous. Dermal membrane spiculous; tension spicula acuate, long, and slender, rather numerous, dispersed, with an admixture occasionally of stout acuate spicula. Skeleton.—Reticulations irregular, rather wide; fibre slender, rather sparingly spiculous; spicula acuate, variable in size, long, and slender, with an admixture of large stout acuate ones. Interstitial membranes spiculous, the same as those of the dermal membranes, and about as numerous. Gemmules membranous, aspiculous.

Colour.—In the dried state; brown.

Habitat.—Fowery Harbour; Mr. C. W. Peach.

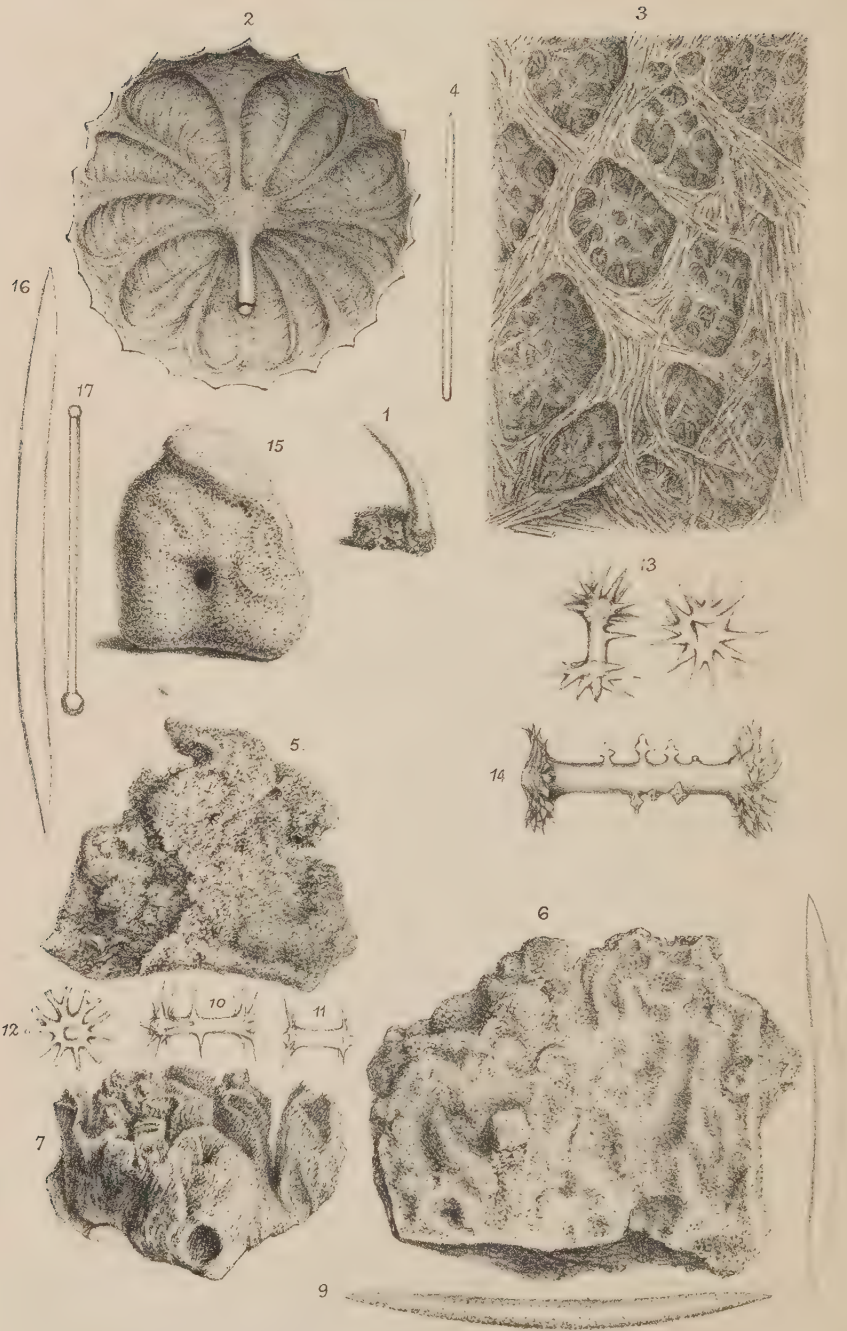
Examined.—In the dried state.

The sponge which is the type of this species is a mere fragment, about an inch in length, by a little more than half an inch in breadth, and it presents no external characters by which it could have been recognised as a species; but its internal structural characters are distinctly different from those of the only other British species of Desmacidon, *D. constrictus*, with which it is possible to confound it. The oscula and pores are not available, but there is fortunately a small fragment or two of the dermal membrane in a good state of preservation. It is pellucid, and rather abundantly supplied with tension spicula, and occasionally with a few of the stouter acuate spicula intermixed with them. The tension spicula of the dermal and interstitial membranes are slightly less than those of the skeleton fibre, but when separated by boiling in nitric acid they are not to be distinguished from each other, but the difference between them and the larger auxiliary acuate spicula is very distinct. An average-size skeleton spiculum measured was $\frac{1}{358}$ inch in length, and $\frac{1}{17647}$ inch greatest diameter, while one of the large auxiliary spicula measured $\frac{1}{275}$ inch in length by $\frac{1}{10000}$ inch diameter. In contrast with these measurements, a skeleton spiculum of *D. constrictus* measured $\frac{1}{79}$ inch in length, and $\frac{1}{3333}$ inch diameter, a difference so great as to at once render apparent the specific difference of the two species; and in addition to the discrepancy in size, there is not the slightest indication of the constriction at the basal portion of the skeleton spiculum of *D. incognitus*, that is so distinctive a character in *D. constrictus*. The intermixture of the large, acuate, auxiliary spicula with those of the skeleton fibre is of rare occurrence, but they may be frequently observed cemented to the external surface of the fibre. The admixture of these larger spicula in the skeleton fibre and in the membranous structures is an unusual event. Generally speaking the skeleton spicula would be the largest and strongest in

the sponge, but in this case they are not so, as will be seen by the measurements already given.

The gemmules are rather numerous. They are membranous and round, or oval in form, and very similar to those found in other species of the genus. They vary considerably in size; the largest and best developed ones are attached to the inner surface of the dermal membrane. One of the largest measured $\frac{1}{566}$ inch in diameter.

. Plate LXXXVI .



Ciocalypta Leei 1–4. Spongilla Parfitti 5–14
S. sceptrifera 15–17.

W.LensAldous del et lith. W.West & Co imp.

PLATE LXXXVI.

Ciocalypta Leei, *Bowerbank.*

Fig. 1.—Represents the type specimen based on a small stone. Natural size.

Fig. 2.—A view of a fractured section of the interior of the sponge, near the base of the penicillate organ, at right angles to its long axis, exhibiting the polyspiculous fasciculi radiating from the central axis to the circumference of the sponge. × linear.

Fig. 3.—Represents a portion of the dermal surface of the penicillate organ with its polyspiculous network and porous areas. × 80 linear.

Fig. 4.—An acuate skeleton spiculum. × 80 linear.

Spongilla Parfitti, *Bowerbank.*

Fig. 5.—Represents the type specimen of the species, from the river Exe. Natural size.

Fig. 6.—A specimen of the same species from the Salmon Pool, Exeter. Natural size.

Fig. 7.—A variety in form of the same species from Trews Weir, Exeter. Natural size.

Fig. 8.—Represents one of the spineless, acerate, skeleton spicula of *Spongilla Parfitti.* × 250 linear.

Fig. 9.—One of the incipiently spinous, skeleton spicula of *S. Parfitti.* × 250 linear.

Fig. 10.—One of the largest rotulate spicula from an ovary of *S. Parfitti,* with two large spines on its shaft. × 530 linear.

Fig. 11.—One of the smaller and more usual size of rotulate spicula from an ovary of *S. Parfitti.* × 530 linear.

Fig. 12.—A view of one of the best developed rotulæ from *S. Parfitti*. × 530 linear.

Fig. 13.—Two views of a rotulate spiculum from an ovary of *Spongilla fluviatilis* for comparison with those of *S. Parfitti*. × 530 linear.

Fig. 14.—An average-sized spiculum from an ovary of *Spongilla Meyeni* from Mr. Carter. × 530 linear. Exhibiting the great difference in size as compared with the similar organs from *S. fluviatilis* and *S. Parfitti*.

Spongilla sceptrifera, *Bowerbank*.

Fig. 15.—Represents the type specimen from one of the Exeter reservoirs. Natural size.

Fig. 16. — One of the acerate skeleton spicula. × 250 linear.

Fig. 17.—Represents one of the minute sceptriferous tension spicula from the interstitial membranes. × 530 linear.

Ciocalypta Leei, *Bowerbank*.

Plate LXXXVI.

Sponge sessile, thinly coated, furnished with one or more long, slender, pellucid, conical, penicillate organs. Surface smooth. Oscula simple, minute, dispersed on the conical penicillate organ. Pores numerous, congregated in the areas of the dermal reticulations. Dermal membrane of the basal portion abundantly spiculous; spicula dispersed, acuate like those of the skeleton; dermal membrane of the penicillate organ reticulated; rete polyspiculous, strong, and open. Skeleton.—Spicula acuate, rarely sub-fusiformi acuate, variable in size.

Colour.—In the dried state; white.

Habitat.—Ilfracombe; Mr. Henry Lee.

Examined.—In the dried state.

I received this interesting and beautiful little species from my friend Mr. Henry Lee. It was dredged up off Ilfracombe. It is seated on a small mass of stone, which is partly enveloped by the basal membranous portion of the sponge that closely adheres to it; the remainder of the stone being covered by extraneous matters. On closely examining the specimen I found there was a fracture near the base of the conical penicillate organ of nearly the whole of its circumference, which enabled the upper portion to be bent down so as to exhibit a section of the interior of the organ by direct light, as represented by figure 2, with a portion of the slender central axis projected towards the eye, and the radiating fasciculi with their expanded terminations on the inner surface of the dermis, thus exhibiting a close approximation to the corresponding structural peculiarities of the type of the genus *Ciocalypta penicillus*, but on a much smaller and more delicate scale. The oscula are in greater numbers towards the distal termination of the penicillate organ, a few only being apparent on its proximal portion. The pores are abundantly distributed over the whole of its surface in groups, within the areas of the dermal network, and nearly the whole of them were in an open condition, as represented by fig. 3, which exhibits a small portion of the surface of the column by direct light. A fragment from the surface near the base of that organ, mounted in Canada balsam, was so very pellucid, as to scarcely allow of the pores within the areas of the dermal rete being visible with a power of 80 linear.

The thin basal membrane of the sponge, partially spread over the small mass on which it is seated, did not present the same reticulated structure that characterises the penicillate organ. The spicula were abundantly but irregularly dispersed on its surface, and I did not detect, on the small portion examined, either oscula or pores. There is but one form of spicula which is common to all parts of the sponge, but they

vary to a considerable extent in size. The smaller ones are purely acuate, but the larger and longer ones frequently exhibit a tendency to the fusiform shape. The larger ones are often twice the length and diameter of the smaller ones with which they are indiscriminately mixed.

As we are acquainted with but one specimen of this beautiful little species, I have, in describing it, stated that it is "furnished with one or more conical penicillate organs;" the latter suggestion can only be verified by the acquisition of other specimens hereafter. Reasoning from the structure of *C. penicillus* and *C. Tyleri*, it is not improbable that the number of these organs in more fully developed specimens may be greater than in the one in course of description.

Few men have served and advanced the cause of Marine Natural History more zealously and disinterestedly than my friend Mr. Henry Lee, and I therefore have great pleasure in naming this interesting species after him, as a small tribute of respect for his scientific ardour and ability.

Spongilla Parfitti, *Bowerbank*.

Spongilla Meyeni, var. *Parfitti*, Carter. Ann. and Mag. Nat. Hist., 4th ser., vol. i, p. 247.

Plate LXXXVI.

Sponge massive, sessile, uneven, hispid. Oscula simple, dispersed, rather large. Pores conspicuous. Dermal membrane pellucid, aspiculous. Skeleton.—Spicula acerate of two kinds; acerate, smooth, and the same form incipiently spinous; the two irregularly mixed in the skeleton; the latter fewer in number than the former. Ovaria subglobose; spicula birotulate, short, more or less spinous; spines long and acutely terminated; disposed in lines radiating from the centre of the ovarium; rotulæ nearly equal in size, deeply and irregularly dentate.

Colour.—Olive green or yellow.

Habitat.—River Exe, Devonshire; Edward Parfitt, Esq.

Examined.—In the dried state.

This interesting addition to the list of the British spongillas was discovered in the river Exe at the Salmon Pool near Exeter, by Mr. Edward Parfitt, who found large patches of it rather exceeding an inch in thickness on the timbers of the Wear. On carefully examining it he detected the differences existing between the spicula of its skeleton and those of *Spongilla fluviatilis*, which it very closely resembles in habit and external appearances; and in his letter to me on the subject he writes, "I am strongly impressed that this is an intermediate form between *S. fluviatilis* and *S. Meyeni*," and in this opinion I fully concur. Mr. Parfitt sent a portion of this species to Mr. Carter, who has described it in the 'Ann. and Mag. Nat. Hist.' for April, 1868, as a variety of *Spongilla Meyeni*, and designates it *S. Meyeni*, var. *Parfitti*. How this British spongilla can be a variety of a species that does not exist in England, or to the best of my knowledge nearer than Bombay, is quite past my comprehension, and I have therefore described it as a distinct species under the title of *S. Parfitti*.

The approximation of *S. Parfitti* to *S. Meyeni* lies in the spination of a portion of the skeleton spicula, but the divergence of the two species is strongly marked in the structural peculiarities of the rotulate spicula of their ovaria, not only in the great difference in their respective sizes but more especially in the spination of their shafts. In both species the shafts of the rotulate spicula are frequently spineless. In *S. Parfitti* in the fully developed spiculum the shaft frequently has from one to three spines, and they always attenuate to an acute point, while in a fully developed rotulate spiculum of *S. Meyeni* the spines are comparatively short and thick, and they terminate bluntly in a figure very like an ace of clubs on a playing card, as represented

in fig. 14 from a specimen of the sponge from Bombay presented to me by Mr. Carter many years since. The rotulate spicula of the ovaries of *S. Parfitti* very closely resemble those of *S. fluviatilis*, but they are rather smaller; the skeleton spicula are also rather smaller than those of *S. fluviatilis*. Fig. 16 is of exactly the same size and form as those of the last-named species, so that a comparison of fig. 16 with figs. 8 and 9 represents the proportional differences existing between the two species under consideration.

The greater number of the rotulate spicula in *S. Parfitti* are like that represented by fig. 11, and this appears to be the normal form. The larger one with the spiculated shaft, represented by fig. 10, is of comparatively rare occurrence.

Spongilla sceptrifera, *Bowerbank.*

Plate LXXXVI.

Sponge massive, sessile. Surface smooth and even. Oscula simple, large. Pores inconspicuous. Dermal membrane pellucid, abundantly spiculous; spicula acerate, very minute, and sceptriform spicula with bulbous terminations; bulbs of unequal size, very minute. Skeleton.—Reticulations rather close and compact, but slender; spicula acerate, rather large. Interstitial membranes.—Retentive spicula slender and very minute, few in number. Ovaria unknown.

Colour.—Dried state, light fawn yellow.

Habitat.—On *Anacharis alsinastrum* in one of the Exeter reservoirs; Mr. Edward Parfitt.

Examined.—In the dried state.

We are indebted to the acute discrimination of Mr. Edward Parfitt, of Exeter, for our knowledge of this interesting addition to the list of our British spongillas. He found one specimen only growing on *Anacharis alsinastrum*, the one represented by fig. 15,

Plate LXXXVI. There is but a single large oscular orifice, beneath which is a cavity of considerable size, into which other orifices apparently discharge the fæcal streams of the sponge previous to their ultimate ejection from the large external one. Very little of the dermal membrane remains on the sponge, but on a small fragment of it mounted in Canada balsam the characteristic sceptriform tension spicula were rather abundant. They are so slender and minute that without the aid of a microscopic power of five or six hundred linear they would most probably elude observation. The minute acerate tension spicula are the most abundant of the two forms, and they are very much more slender and minute than the sceptriform ones. Both forms of spicula are mixed together and irregularly distributed over the inner surface of the dermal membrane. The structure of the skeleton is more compact than that of *Spongilla lacustris*, but the spicula of which it is composed are quite as large as those of the last-named species, so that the two may be readily mistaken for one species by a hasty observer.

A few of the skeleton spicula have a slight central inflation, but this is of such rare occurrence as scarcely to be considered as a specific character.

Plate LXXXVII.

Hymedesmia indistincta 1–10. Isodictya obscura 11.

W. Lens Aldous del. et lith. W. West & Co. imp.

PLATE LXXXVII.

Hymedesmia indistincta, *Bowerbank.*

Fig. 1.—Represents the fragment of a bivalve shell nearly covered by the thin coating of the sponge. Natural size.

Fig. 2.—A small piece of the sponge mounted in Canada balsam. × 150 linear.

Fig. 3.—One of the long, slender, acerate tension spicula from the dermal membrane. × 250 linear.

Fig. 4.—A bidentate, equi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 5.—One of the dentato-palmate equi-anchorate retentive spicula from the dermal membrane. × 530 linear.

Fig. 6.—One of the long, slender, attenuato-acuate skeleton spicula. × 150 linear.

Fig. 7.—The basal portion of one of the skeleton spicula. × 250 linear. Exhibiting the mode of its basal spination.

Fig. 8.—One of the cylindrical entirely spined tension spicula of the basal membrane. × 250 linear. These spicula are frequently of unequal diameter.

Figs. 9 and 10.—Two of the acuate, entirely, but incipiently, spined internal defensive spicula from the basal membrane. × 250 linear.

Isodictya obscura, *Bowerbank.*

Fig. 11.—Represents the best and most satisfactory specimen of the species that I have yet seen.

In the type-specimen of this species, represented in Plate LXXVI, a small portion of the species only is

visible, as the greater part of its surface is covered by a thin coating of *Hymeniacidon lactea*. On the 5th February, 1873, I fortunately obtained from Miss Oliver, a dealer in objects of natural history at Hastings, a fresh specimen of the species very nearly enveloping a small crab, probably *Pisa Gibbsii*, and fortunately without any spongeous envelopment. When in the fresh condition it was of a dark purple colour, very soft to the touch, and it shed an abundance of fluid scarcode. In the living state the surface was quite smooth in appearance, but as it dried it became rough and uneven, and it retained its dark purple colour. In all its structural characters it was in perfect accordance with those of the type-specimen.

Hymidesmia indistincta, *Bowerbank*.

Plate LXXXVII.

Sponge coating, surface smooth, rather uneven. Oscula simple, minute, dispersed. Pores inconspicuous. Dermal membrane spiculous; tension spicula acerate, long and slender, abruptly pointed, dispersed, or loosely fasciculated; retentive spicula; bidentate equianchorate, and dentato-palmate equi-anchorate. Skeleton.—Fasciculi loosely and irregularly constructed; frequently composed of not more than two or three spicula, irregularly disposed. Spicula attenuato-acuate, long and slender, variable in size; basally, incipiently spinous. Basal membrane abundantly furnished with cylindrical entirely spined tension spicula, fasciculated or dispersed singly, rather stout and large; and also with numerous internal defensive spicula, acuate, entirely but incipiently spinous; retentive spicula same as those of the dermal membrane.

Colour.—Light brown in the dried state.

Habitat.—Shetland; Rev. A. M. Norman.

Examined.—In the dried state.

I received this sponge preserved in spirit from my friend the Rev. A. M. Norman, who dredged it at Shetland in 1867. It covers nearly the whole of the surface of the fragment of a bivalve shell, and it does not exceed about the fourth part of a line in thickness.

At the first examination of a piece of this sponge mounted in Canada balsam with a power of about 150 linear the spicula appear to be confusedly mixed together, and it is not until after a close and careful examination with a still higher power that the apparent confusion becomes comprehensible and the mixed mass of spicula can be assigned to their respective offices, and the abundance of the dark amber-coloured sarcode in which they are embedded increases the apparent confusion.

The tension spicula of the dermal membrane are purely acuate in their form, the diameter being equal throughout the whole of the length until very near each termination, when they are rapidly contracted and terminate acutely. A few of them are dispersed singly, but their mode of disposition is usually in loosely formed fasciculi, which appear either isolated or crossing each other irregularly.

Their mode of disposition is not very readily distinguishable, even when a portion of the sponge has been mounted in Canada balsam, in consequence of the abundance of deeply coloured sarcode, and of the numerous and confused mass of spicula immediately beneath them. Under these circumstances they require a power of about 250 linear to render them distinctly visible. The two forms of retentive spicula in the dermal membrane, are very minute and delicately formed, they are few in number, and it is rarely that they can be detected *in sitú*.

The skeleton fasciculi are loosely constructed, and very irregularly disposed, and interspersed with them, there is a considerable number of single spicula of the same form, some of which are twice the diameter and

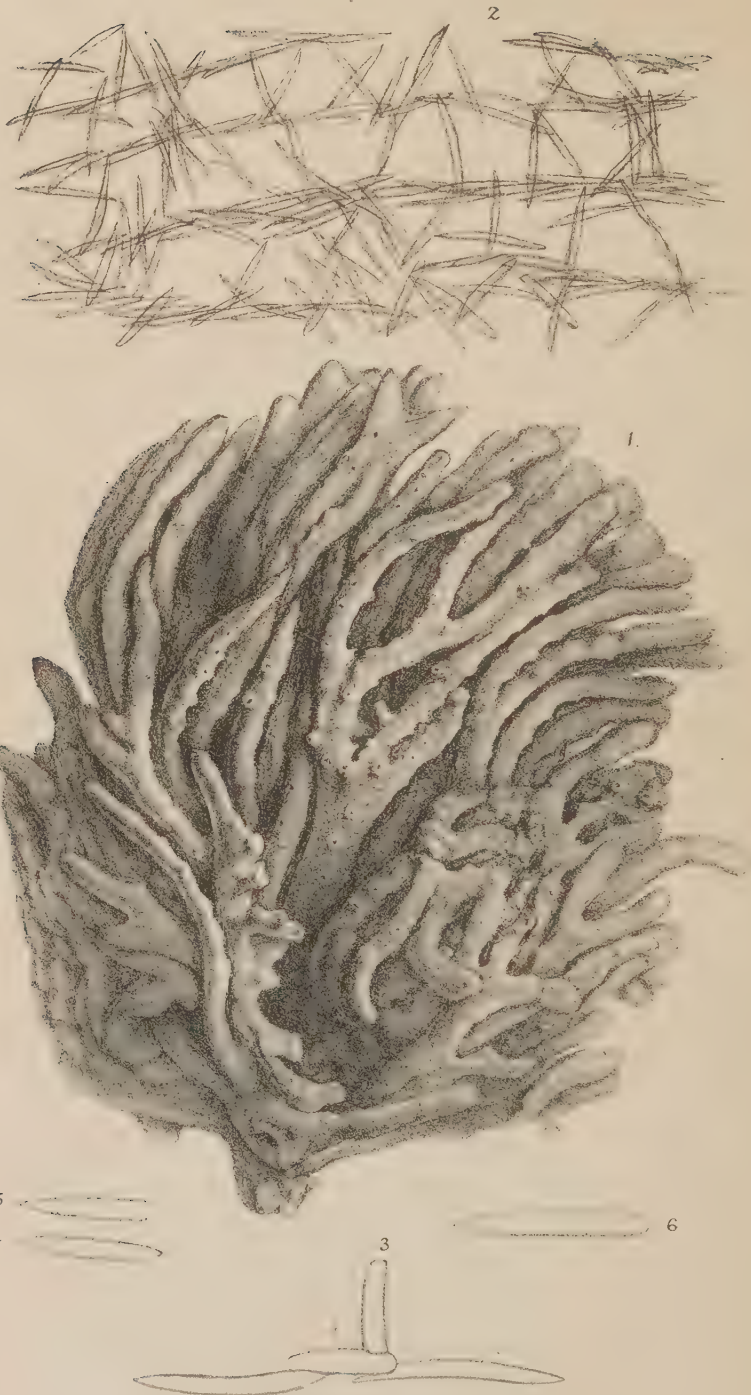
length of those composing the fasciculi. The whole of the skeleton spicula agree in the mode of the attenuation of their forms, it commences very near the base and continues to the slender and acute distal termination. Their basal terminations vary considerably in shape; some are more or less inclined to be spinulated; in others they are slightly attenuated, while the greater portion are purely acuate. In some the spination of the basal extremity is so incipient as scarcely to be visible, while in others it is more distinctly produced; but it never seems to extend much beyond the base of the spiculum.

The cylindrical, entirely spined, tension spicula of the basal membrane are very numerous; they vary somewhat in their forms, many of them being inequicylindrical to such an extent as to closely approach the acuate form; but the normal form is cylindrical.

Their mode of disposition is very irregular; occasionally they are fasciculated, three or four together; but the greater portion of them are irregularly dispersed over the surface of the membrane.

The retentive spicula are the same as those of the dermal membrane, and as in that organ they are rather few in number.

The internal defensive spicula are numerous; they are projected from the basal membrane at about right angles to its plane, and they pass through the substance of the sponge to very near its external surface. They all agree in form, but vary to a considerable extent in length.



Isodictya varians.

W. Lens Aldous del. et lith.

W West & C° imp

PLATE LXXXVIII.

ISODICTYA VARIANS, *Bowerbank.*

Fig. 1.—A well-developed specimen of the species. Natural size. In the collection at the museum of the Public Free Library, Liverpool.

Fig. 2.—A small portion of the skeleton of the sponge exhibiting the mode of the disposition of the spicula and the variations in the structure of its primary lines. × 127 linear.

Fig. 3.—Represents a small fragment of the skeleton projecting from a section at right angles to its surface, showing the mode of the intermixture of the various forms of spicula in its reticulated structure. × 250 linear.

Fig. 4.—One of the sub-fusiformi-acerate skeleton spicula. × 250 linear.

Figs. 5 and 6.—Two of the acuate spicula occasionally mixed with the normal acerate, one in the skeleton structures of the sponge. × 250 linear.

ISODICTYA VARIANS, *Bowerbank.*

Plate LXXXVIII.

The type-specimen of this sponge in the Johnston collection of British sponges in the British Museum is a small fragment only of a larger specimen, and I have much pleasure in figuring a very much more satisfactory one which I obtained through the kind assistance of Mr. T. Higgin, of Liverpool, and Mr. Moore, of the Free Public Library and Museum of Liverpool.

Mr. Higgin informs me that the species has been

found in considerable numbers at one locality at the mouth of the Mersey, and that the largest he has seen was eight inches in height with a lateral spread of about six inches; and among other specimens sent to me from the Liverpool Museum for examination there was a specimen of *I. varians* of a rudely palmate form rather less than two inches in height and rather exceeding half an inch in breadth. No two of the larger specimens that were sent to me were alike in form, and one of them eight inches in height had no appearance of the compact clustered form exhibited by the figured one, but consisted of numerous slender ascending branches dividing dichotomously at intervals, and the greatest lateral spread did not exceed two inches. This species appears to be quite as variable in the mode of the disposition of its branches, as *Chalina oculata*, which it closely resembles, but whatever their height and size may be, they always appear to be very much more slender and delicate than those of *C. oculata*, for which they might otherwise be very readily mistaken if judged only by their external characters, and this error is the more likely to occur as the disposition of the oscula in both species is alike. In structural characters, whatever may be the size of the specimens, they all agree with those of the little type one in the British Museum.

In the description of the specific characters of the type-specimen, page 281, vol. ii, I have stated "surface smooth and even." In these better preserved specimens the surface is minutely hispid by the prolongation of the primary lines of the skeleton.

The increased knowledge that we have obtained of the structural peculiarities of this sponge renders it necessary that we should reconstruct its specific characters, and I propose that the following should be substituted for those in vol. ii, page 281, 'Mon. Brit. Spongiadæ.'

Isodictya varians, *Bowerbank.*

Halichondria cinerea, Johnston. Mon. Brit. Spongiadæ, vol. ii, p. 281.

PLATE LXXXVIII.

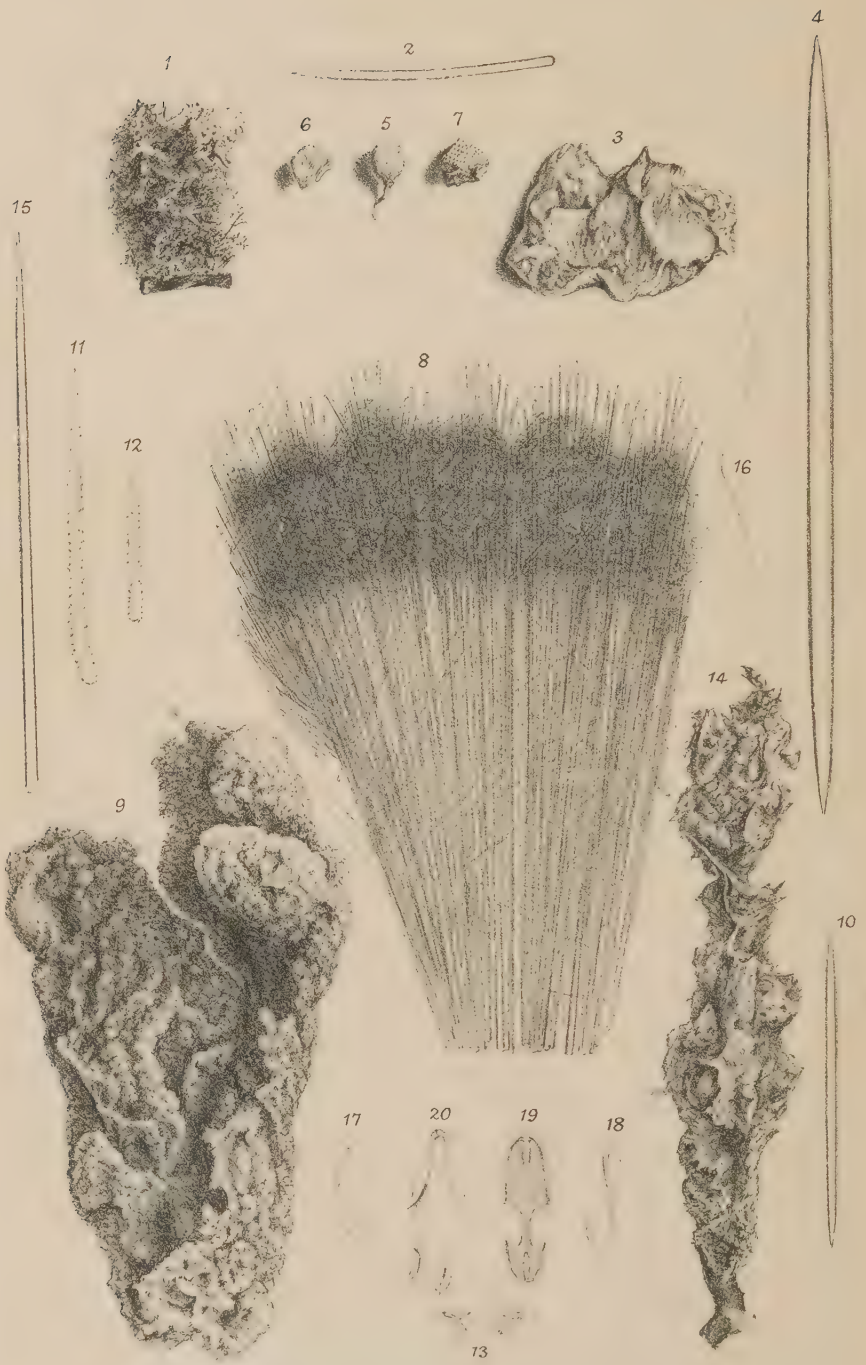
Sponge ramose, pedicle short, branches slender, cylindrical, terminating hemispherically, dividing dichotomously or trichotomously; surface even, minutely hispid. Oscula small, slightly elevated, usually arranged in lines, on one side of the branch. Skeleton symmetrical; primary lines rarely more than unispiculous; secondary lines unispiculous; rete rarely more than one spiculum wide; spicula sub-fusiformi-acerate, short and stout, with a few short and stout acuate and cylindrical ones intermixed with them. Interstitial membranes, spicula sub-fusiformi-acerate, rather slender.

Colour.—In the dried state; light ochreous yellow.

Habitat. — Shetland: Mr. Barlee, mouth of the Mersey, near Liverpool; Mr. T. Higgin.

Examined.—In the dried state.

Plate LXXXIX.



Desmacidon pannosus 1-2. Isodictya incerta 3-4.
Tethea cranium 5-8. Microciona Kentii. 9-13.
Desmacidon similaris 14-20.

W. Lens Aldous del et lith. W. West & C° imp.

PLATE LXXXIX.

DESMACIDON PANNOSUS, *Bowerbank.*

Fig. 1.—The type-specimen. Natural size.
Fig. 2.—One of the acuate skeleton spicula. × 250 linear.

ISODICTYA INCERTA, *Bowerbank.*

Fig. 3.—The type-specimen. Natural size.
Fig. 4.—One of the large acerate spicula of the skeleton. × 250 linear.

TETHEA CRANIUM, *Lamarck.*

Fig. 5.—Represents the most perfect of the specimens of pedicelled gemmules of *T. cranium* sent to me by Mr. Barlee. Natural size.
Fig. 6.—A view of the interior of a specimen sectioned perpendicularly. Natural size.
Fig. 7.—Represents the external surface of the specimen, figure 6.
Fig. 8.—Represents a portion of the section taken from the inner surface of the same sponge as figure 6, extending from the distal margin to very close to the top of the pedestal, and exhibiting the continuation of the skeleton fasciculi from the base to the apex of the sponge. × 36 linear.

MICROCIONA KENTII, *Bowerbank.*

Fig 9.—Represents the type-specimen of the species, in the cabinet of Mr. W. Saville Kent. Natural size.

Fig. 10.—One of the fusiformi-acerate skeleton spicula. × 250 linear. This figure also represents the tension spicula of the dermal membrane and the external defensive spicula.

Figs. 11 and 12.—Two of the acuate, entirely spined, internal defensive spicula. × 250 linear.

Fig. 13.—A bidentate, equi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Desmacidon similaris, *Bowerbank.*

Fig. 14.—Represents the type-specimen in the cabinet of the Rev. A. M. Norman. Natural size.

Fig. 15.—One of the skeleton spicula. × 250 linear. This figure also represents the tension spicula of the dermal membrane.

Fig. 16.—One of the slender, acerate, tricurvate, tension spicula of the dermal membrane. × 250 linear.

Fig. 17.—A simple bihamate retentive spiculum from the dermal membrane. × 250 linear.

Fig. 18.—One of the contort, bihamate, retentive spicula from the dermal membrane. × 250 linear.

Fig. 19.—A dentato-palmate, inequi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 20.—One of the bidentate, inequi-anchorate, retentive spicula from the dermal membrane. × 530 linear.

Desmacidon pannosus, *Bowerbank.*

Plate LXXXIX.

Sponge massive, sessile. Surface rough, ragged and open. Oscula and pores unknown. Dermal membrane sparingly spiculous; spicula acuate, rather short and stout, very variable in diameter; same size as those of the skeleton. Skeleton very open; fibre

compact, but rather slender; spicula acuate, rather short and stout. Interstitial membranes aspiculous or very sparingly spiculous; spicula same as those of the skeleton.

Colour.—In spirit, light ochreous yellow.

Habitat.—Jersey; Rev. A. M. Norman.

Examined.—From spirit.

This sponge in a bottle of spirit was sent to me by my friend the Rev. A. M. Norman, who dredged it at Jersey in 1867. It is based on the side of a small fucoid stem about one tenth of an inch in diameter. It is an inch in height, three fourths of an inch broad, and about half an inch in thickness. Its surface is open and very uneven and ragged in appearance; but from the state of the interstitial membranes and the sarcode with which they are coated, it was evidently in a living state when taken. There is a remarkable paucity of structural characters. Excepting a few, evidently extraneous spicula, there was one form only in the structures, and that was acuate, rather short, and very variable in diameter. On some parts of the dermal membrane there were a few of these spicula irregularly disposed, while other parts were aspiculous and the same observation applies equally well to the interstitial membranes.

Notwithstanding a very careful examination of the membranes *in sitú* and of the spicula prepared by nitric acid, I could not find the slightest trace of any one of the forms of retentive spicula that are usually found in the structures of the Desmacidons. Our dependence for the recognition of the species rests only on its external characters and the form of its skeleton spicula, and it is fortunate that both these characters are very effective in its discrimination, and the spicula especially so; they are distinctly different in size and proportions to those of any other known species of British Desmacidon. The negative evidence of the total absence of the retentive spicula is also valuable in determining the species.

Isodictya incerta, *Bowerbank.*

Plate LXXXIX.

Sponge sessile, more or less fan-shaped. Surface smooth and even. Oscula simple, minute, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; spicula irregularly reticulated; rete unispiculate, occasionally fasciculated, same form and size as those of the skeleton. Skeleton very diffuse and irregular; primary lines multispiculous; secondary lines mostly unispiculous, numerous and very irregular; spicula acerate, rather large.

Colour.—In the dried state, milk white.

Habitat.—Isle of Mull, Rev. A. M. Norman.

Examined.—In the dried state.

I received four of these little sponges for examination from Mr. Norman; the whole of them were of a compressed or fan-shaped form, and of thickness of about two or three lines, the figured one being the largest of the four. The basal attachment in all the specimens was at one edge of the thin plate of sponge, and both the broad surfaces were evidently inhalent ones. Very few of the oscula were visible, and those were very minute. The pores were not visible to the unassisted eye, but in portions of the dermis mounted in Canada balsam they were seen to be numerous, but rarely more than one in any of the areas of the dermal reticulations.

The reticulations of the skeleton are wide and very irregular. The primary lines are multispiculous, and the secondary series are so irregular and numerous that its structure is not readily determined unless under favorable circumstances, in a section carefully cut at right angles to the surface. There is no appreciable difference in the size and form of the spicula of the skeleton and those of the dermal membrane, and no other form could be detected in any part of the sponge.

The only species of known British Isodictya with

which this sponge might be confounded is *I. fallax*, but in that species there are numerous tricurvate tension spicula; and the skeleton spicula are much smaller and more delicate in their proportions, being in their length as two to three in *I. incerta*.

The reticulations of their dermal membranes also differ considerably. In *I. fallax* it is rarely ever more than unispiculate, and very delicate in its general aspect; while in *I. incerta* it is much coarser in its structure. The difficulty in the discrimination of these two species is also increased by their being as nearly as possible of the same colour in the dried state; but a comparison of the size of the skeleton spicula of *I. fallax* represented in Plate LI, fig. 11 with those of *I. incerta* in Plate LXXXIX, fig. 4, will greatly assist their discrimination; the spicula of both species being figured to the same scale. × 250 linear.

Tethea cranium, *Lamarck*.

Plate LXXXIX.

The propagation of the genus Tethea by gemmulation exhibits some remarkable variations. One of the most striking modes of external gemmulation is that which obtains in *Tethea lyncurium* which I have described in page 149, vol. i, of the present work, and represented in Plate XXV, 342. In this case the young sponge elevated on its pedestal is constructed in a form closely representing the adult state, the skeleton radiating from its centre. In both cases described in vol. ii, p. 93 the gemmules pullulated from near the base of the sponge, and no other mode of propagation was detected. Since then I have found a very similar case of gemmulation in *Tethea Ingalli* from Australia which I have described and figured in 'Proceedings of the Zoological Society of London' for 1872, page 115, plate v, fig. 12; but differing in having the gemmule closely adherent to the base of the sponge, without any indication of a

pedestal. In another species, *Tethea Norvagica*, we find numerous pedicelled gemmules springing from all parts of the parent sponge.

This species is described in the same volume of the 'Proceedings of the Zoological Society,' p. 121, plate v, figs. 18—25.

The specimens under consideration vary more or less from either of the preceding cases. Although I have had a large number of specimens of *Tethea cranium* through my hands, I have never observed an external case of gemmulation although the interior of the sponges abounded with those organs. The specimens under consideration were sent to me by Mr. Barlee from Shetland in the state in which they are represented, excepting that one of them was divided by me perpendicularly for the purpose of obtaining sections to exhibit its anatomical structure, and it was found that the skeleton, instead of radiating from the centre of the young sponge was based upon the distal extremity of the pedestal whence it radiated in every direction.

The spicula obtained from a small slice of the sectioned specimen, fig. 6, were precisely of the same description as those taken from adult specimens of *T. cranium* with this remarkable difference, that the porrecto-ternate defensive ones were some of them of the same size and proportions as those of the adult sponges, and others were as those of the gemmular bodies, thus indicating the transition of the external gemmule from the younger to the more mature stage of its development. Many of the recurvo-ternate ones were also in an immature state of development. In all their anatomical characters these little specimens agree so perfectly with the corresponding parts in the adult specimens as to render their identification with the adult unmistakable.

Microciona Kentii, *Bowerbank.*

Plate LXXXIX.

Sponge parasitical on fuci, sessile, massive. Surface uneven, papulous, smooth. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula fusiformi-acerate, rather short and stout, same size as those of the skeleton columns, dispersed, or occasionally irregularly fasciculated; retentive spicula bidentate equi-anchorate, rather abundant. Skeleton.—Columns slender, diffuse and irregular, branching at intervals; spicula fusiformi-acerate, rather short and stout.

External defensive spicula same as those of the skeleton. Internal defensive spicula. Attenuato-acuato entirely spined, very variable in size, numerous. Interstitial membranes spiculous; tension spicula same form as those of the skeleton but more slender, retentive spicula same as those of the dermal membrane.

Colour.—Preserved in spirit, dull ochreous yellow, with a tint of green; dried, dull ochreous yellow.

Habitat.—Jersey and Strangford Lough; Rev. A. M. Norman. Guernsey, Mr. W. Saville Kent.

Examined.—From spirit and in the dried state.

This sponge was dredged off Guernsey by Mr. W. Saville Kent in the summer of 1870. It surrounds the stem of a fucus for two inches in height, and its greatest diameter is about one inch. Its substance is permeated in every direction by branches of *Corallina officinalis* to such an extent as to entirely conceal the sponge until a portion of them was removed. The papulous condition of the surface is produced by the projection of the distal ends of the skeleton columns, the spicula of which radiate as they approach the surface, but in their natural state do not appear to pass through the dermal membrane. The oscula are simple and so small as not to be visible without the aid of a two-inch lens. In a specimen of the dermal

membrane mounted in Canada balsam the pores were seen to be irregularly dispersed; they were rather large, comparatively, and were in an open condition.

The dermal membrane abounds in its characteristic spicula. The tension ones are quite as large, and of the same form as those of the skeleton; and the retentive ones are also abundant. They appear to be all nearly equal in size, and when *in sitú* they are attached by the middle of the back of the shaft of the spiculum so as to project both the anchorate terminations from the membranous surface to which they are attached.

The skeleton columns are slender but compact in their structure, branching at intervals and winding irregularly towards the surface of the sponge. The internal defensive spicula, projected from the columns in every direction, are exceedingly numerous and many of them are comparatively very large and long; some of them are profusely spinous, the spines being stout and conical; while in others the spination is much more delicately produced.

This species is closely allied to *M. fictitia*, and might readily be confounded with that species by a hasty observer; but the forms of the skeleton spicula will always distinguish them. In *M. fictitia* those organs are purely acerate, while in *M. Kentii* they are strikingly fusiformi-acerate; they differ also in comparative size, their lengths are in the former to the latter as seven to four. The retentive spicula of the two species are very similar in form; but they are larger and very much stouter in *M. fictitia* than in *M. Kentii*. I have named this species after my friend Mr. W. Saville Kent, to whom I am indebted for my knowledge of it, and for many other interesting British sponges, the result of his dredging expedition in 1870 in the yacht Norna, with Mr. Marshall Hall.

I have subsequently found among the sponges dredged by the Rev. A. M. Norman at Jersey three specimens of the species in a much finer condition than the type-one found by Mr. Kent. None of the

specimens dredged by Mr. Norman are obscured by Corallina, but, like Mr. Kent's specimen they are all parasitical on the stem or roots of a fucus. The external papulous character prevails in all of them to about an equal extent. The largest of Mr. Norman's specimens is three and a half inches high; at the base there is the fucus on which it has grown, about the size of a goose quill. At an inch above the base the sponge divides into finger-like masses, each from six to eight lines in diameter, and at the summit of each the small branches of the fucus are visible, and there are also on each summit several oscula not exceeding a line or a line and half in diameter. The second specimen is two inches in height, expanding upward from the basal extremity to the apex, where it has a diameter of about eight lines terminating abruptly. The stem of the fucus on which it has grown has been withdrawn from this specimen; but the large central perforation indicating its former presence is very apparent. The third specimen contains the remains of a very slender zoophyte. It is irregularly massive, about one inch and a half in height, and about the same in diameter. Its broad distal end is slightly depressed in the middle and, on its surface there are numerous small simple oscula, none exceeding half a line in diameter; on other parts of the sponge oscula are also observable, and some of them terminate the papulous projections on the dermal surface. Mr. Norman has also found this species at Portaferry, Strangford Lough, in 1869.

Desmacidon similaris, *Bowerbank.*

Plate LXXXIX.

Sponge sessile, coating the stems of fuci. Surface smooth but uneven, often papulous. Oscula and pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula dispersed or closely felted together, subclavate-acuate, as large as those of the

skeleton, also tricurvate, acerate, long and very slender, few in number; retentive spicula simple and contort bihamate, large and numerous; also dentato-inequi-palmato-anchorate, and bidentate inequi-anchorate, minute, and few in number. Skeleton. — Fibre rather stout and compact; spicula subclavate, acuate. Interstitial membranes spiculous; tension spicula acuate, rather numerous, dispersed; retentive spicula same as those of the dermal membrane.

Colour.—In spirit, light ochreous yellow.

Habitat.—Jersey; Rev. A. M. Norman.

Examined.—From spirit.

Among the sponges dredged off Jersey by the Rev. A. M. Norman, I found three pieces of this species. One two and a quarter inches in length on the stem of a fucus three and a half inches long; another rather exceeding two inches in length, and the third, one inch in length. These three, from the exact similarity of the stems of the fucus, the eighth of an inch in diameter, and the general similarity of the sponge coating them, have every appearance of having been originally parts of the same specimen. The sponge completely envelops the stems, but it does not in any part appear to exceed about one tenth of an inch in thickness. The surface of the sponge is smooth but very uneven, and the papulæ are rather numerous, conical in form, and terminating acutely. I could not by the aid of a two-inch lens detect any oscula. In some parts of the dermal membrane there were spaces in which the tension spicula were rather thinly dispersed, and in these the bihamate spicula were seen *in sitú*, but in other parts of the membrane the tension spicula were thickly felted together in such numbers as to entirely obscure the retentive ones beneath them. The basal membrane of the sponge presented a singular fallacious appearance; although the sponge now loosely surrounds the stem of the fucus, it is evident that in the living condition of the plant and sponge the latter very closely embraced the

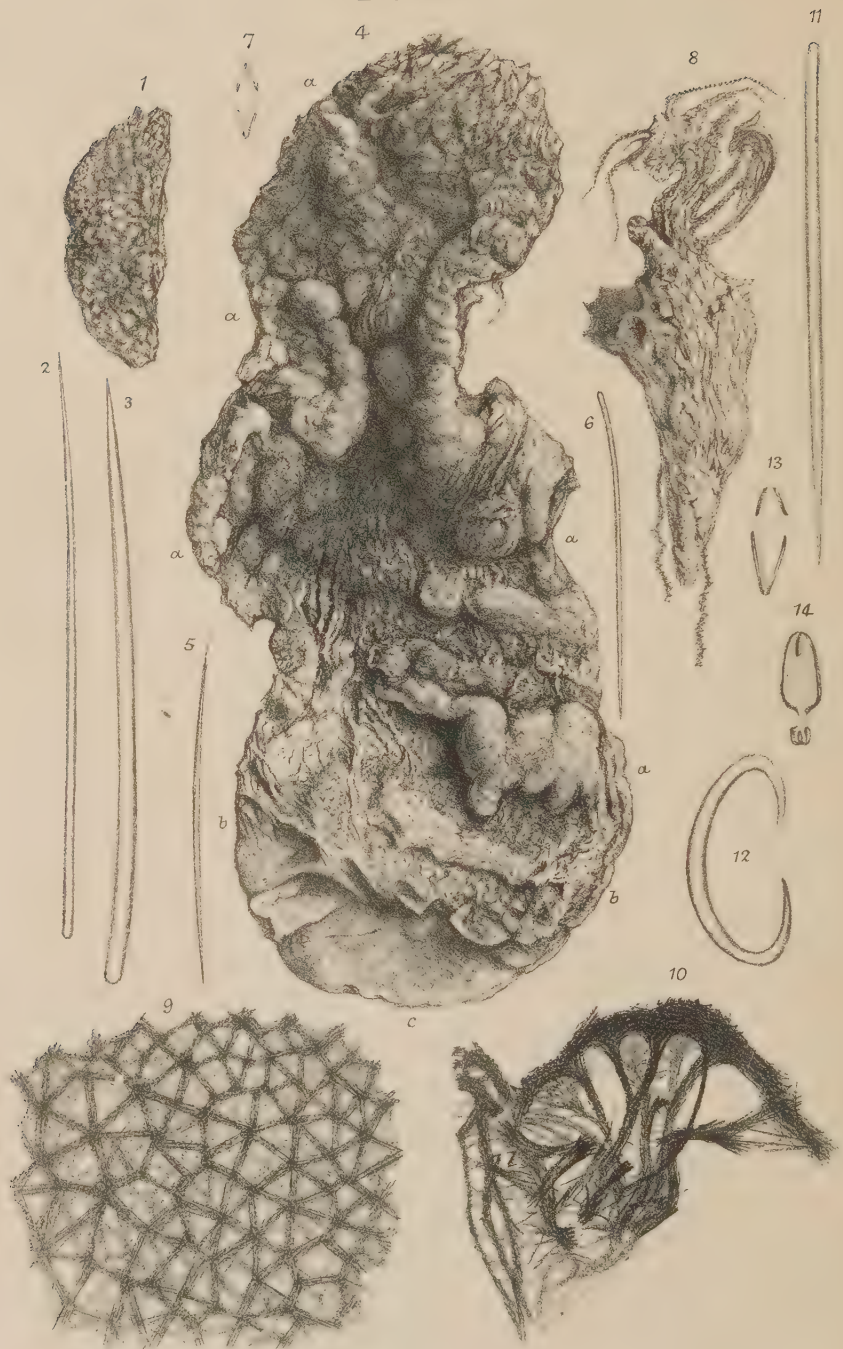
former as the basal membrane has taken an impression of the cellular dermis of the plant, presenting to the eye when mounted in Canada balsam the appearance of a very regular transparent reticulation which might readily deceive an observer into the belief that it was a natural character of the basal membrane.

The form of the skeleton spicula in *D. constrictus* is nearly allied to those of this species; but they differ greatly in size, those of the former being to the latter as eight to three in length; while in the latter the retentive bihamate ones are at least three times as large as those in *D. constrictus*.

The skeleton spicula of *D. cavernula* are of the same size as in *D. simularis*, but they are stouter in their proportions and are fusiform, while in the latter they are slender and purely acuate, and no tricurvate tension spicula could be found in *D. cavernula*. The bihamate retentive spicula in the two species closely resemble each other in size and form.

The nearest structural alliance to *D. simularis* exists in *D. copiosus*, in which, with few exceptions, we find the same forms of spicula. But here again, although the skeleton spicula are similar in size, they differ in being distinctly fusiform; and the tricurvate tension spicula in *D. simularis* are more slender in their proportions and very much longer, being as five to two of those of *D. copiosus*.

Plate XC.



Raphiodesma simplissima 1–3. Isodictya dubia 4–7.
Desmacidon rotalis 8–14.

W. Lens Aldous del. et lith.

W. West & Co. imp.

PLATE XC.

Raphiodesma simplissima, *Bowerbank.*

Fig. 1.—Represents the type-specimen. Natural size.

Fig. 2.—One of the slender acuate spicula from the dermal membrane. × 250 linear.

Fig. 3.—A skeleton spiculum. × 250 linear.

Isodictya dubia, *Bowerbank.*

Fig. 4.—Represents the type-specimen dispersed on the surface of a large dried Ascidian, based on a valve of a dead shell. Natural size. (*a*, *a*, *a*, *a*, *a*) portions of the sponge; (*b*, *b*) Ascidian; (*c*) a part of the inner surface of the shell.

Fig. 5.—An acerate spiculum from the dermal membrane. × 250 linear.

Fig. 6.—One of the acuate skeleton spicula. × 250 linear.

Fig. 7.—One of the bidentate, equi-anchorate, retentive spicula from the dermal membrane. × 530 linear.

Desmacidon rotalis, *Bowerbank.*

Fig. 8.—Represents the type-specimen parasitical on a sertularia. Natural size.

Fig. 9.—A small piece of the dermal membrane with its hexradiate confluent rotulate areas, mounted in Canada balsam. × 36 linear.

Fig. 10.—A section of a portion of the sponge at right angles to its dermal surface, showing the mode of

the terminations of the skeleton fibres on the inner surface of the dermis. × 36 linear.

Fig. 11.—One of the skeleton spicula. × 250 linear.

Fig. 12.—One of the large bihamate retentive spicula from the dermal membrane. × 530 linear.

Fig. 13.—A bidentate, inequi-anchorate, retentive spiculum from the dermal membrane. × 530 linear.

Fig. 14.—One of the dentato-palmate, inequi-anchorate retentive spicula from the dermal membrane. × 530 linear.

Raphiodesma simplissima, *Bowerbank.*

Plate XC.

Sponge compressed, thin, fan-shaped, sessile. Surface smooth and even. Oscula simple, minute. Pores inconspicuous. Dermal membrane abundantly spiculous; spicula acuate, long and slender, closely fitted together. Skeleton.—Fasciculi multispiculous, variable in size and length, disposed irregularly; spicula acuate, long and stout; bases and apices of each fasciculus coincident. Interstitial membranes. Spicula same as those of the dermis, few in number.

Colour.—In the dried state, light brown.

Habitat.—Isle of Mull; Rev. A. M. Norman.

Examined.—In the dried state.

I received a single specimen of this sponge from Mr. Norman in the spring of 1873. It is half an inch in height, one and a quarter in breadth, and it does not exceed a line in thickness. It has a torn base, but has every appearance of having been sessile. The spicula of the dermal membrane are nearly as long as those of the skeleton; they are purely acuate, variable in size, and the largest of them are frequently flexuous. Their mode of disposition is usually irregularly felted together, but sometimes they are parallel to each other, forming irregular patches, and occasionally they are more or less fasciculated. The skeleton fasciculi

are very characteristic of the genus; but their disposition is very irregular; their length is frequently not more than that of a large spiculum, and in all cases the spicula of which they are composed appear to have their bases and apices coincident.

The most remarkable character in this species is a negative one. In every other species of the other British or foreign species with which I am acquainted the dermal membrane is furnished, more or less, with beautiful rosette-shaped groups of inequi-anchorate retentive spicula, and intermixed with them there are frequently numerous bihamate ones; but in this species those forms appear to be entirely absent, and no other form is present than the acuate ones described above. Under these circumstances, this simplicity of structure renders this species more difficult of discrimination than usual; but the fasciculated structure of the skeleton, and the coincidence of the bases and apices of the spicula of which they are composed become the most important characters in its determination.

Isodictya dubia, *Bowerbank.*

Plate XC.

Sponge massive, sessile, nodulous. Surface minutely and irregularly asperated. Oscula simple, dispersed, minute. Pores inconspicuous. Dermal membrane thin and pellucid, abundantly spiculous; spicula acuate, rarely acerate, same size as those of the skeleton, dispersed; retentive spicula bidentate, equi- or slightly inequi-anchorate, minute, and very few in number. Skeleton.—Slender and much complicated; primary lines multispiculous; secondary lines varying from multispiculous to unispiculous, numerous and very irregular; spicula acuate, rarely acerate, variable in size. Interstitial membranes aspiculous?

Colour.—In the dried state, light grey, with a tint of yellow.

Habitat.—Clew Bay, July, 1872; Mr. Samuel Archer. Liverpool Museum.

Examined.—In the dried state.

Among a series of specimens of sponges from the Liverpool Museum sent to me by Mr. T. J. Moore, the curator for examination, there was an unsightly mass of a large dried ascidian attached to an old valve of, apparently, a cardita, covered by minute vegetables, zoophytes, and other matters, and amidst them irregular patches of a soft light grey sponge closely adherent to the ascidian. They do not present a regular even surface, but each patch assumes the appearance of several small sessile nodulous sponges united by approximation. On examining microscopically a portion of one of those little masses I found it to be an Isodictya which I could not refer to any known British species. When examined by the aid of a lens of about two inches focus, the surface presents a somewhat asperated appearance. This is produced by the occasional protrusion of the terminations of the primary lines of the skeleton at various angles.

The oscula are scarcely visible without the assistance of a lens, and I could not, even in a portion of the dermis mounted in Canada balsam, detect the pores. The dermal membrane is very pellucid, and abundantly furnished with spicula of the same form and size as those of the skeleton; from which they can scarcely be separately distinguished *in sitú*, in a portion of the dermis mounted in Canada balsam. The bidentate, equi-anchorate, retentive spicula are exceedingly few in number, and are very minute, requiring a power of seven or eight hundred linear to render them distinctly to the eye.

The skeleton structures are very diffuse and irregular in the mode of their disposition. The primary lines are always more or less multispiculous; and there is no regularity in the spaces between the secondary ones; a few of them are multispiculous. The primary

lines of the skeleton, when they reach the inner surface of the dermis, instead of terminating there, or of passing through that organ, are spread out beneath it to some distance in long slender lines, so that when viewed with a low power through the dermal membrane, they might be readily mistaken for the fibres of a very slender Desmacidon. This peculiarity in the distribution of its structures, at the first sight, complicates their characters to a very considerable extent; but when once recognised it becomes a valuable discriminative character.

From the extremely irregular construction of the skeleton it is rather difficult to say whether there are any tension spicula on the interstitial membranes; and although I searched diligently for them I could not find any of the anchorate retentive spicula on them.

The only species with which *I. dubia* is liable to be confounded is *I. gracilis;* their skeleton structures are very similar, but in the latter the spicula of the primary lines are much stouter than those of *I. dubia*, and in that species the external form is massive and sessile; while in *I. gracilis* it is ramose, and the dermal membrane is aspiculous.

Desmacidon rotalis, *Bowerbank.*

Plate XC.

Sponge parasitical on zoophytes or fuci. Surface even and smooth. Oscula simple, dispersed, minute. Pores inconspicuous. Dermis retiform, rete arranged in hexradiate confluent rotulate areas; radii compact and multispiculous; retentive spicula bihamate, simple and contort, few in number, and rarely bidentate, inequi-anchorate, and dentato-palmate, inequi-anchorate, very minute. Skeleton compact, fibres frequently dividing dichotomously, terminating abruptly on the inner surface of the dermis and dividing to form

the dermal rete; spicula subfusiformi-acuate; bases occasionally sub-clavate. Interstitial membranes.—Tension spicula same size and form as those of the skeleton, dispersed, numerous; retentive spicula same as those of the dermis.

Colour.—In the dried state, light ochreous yellow.

Habitat.—Diamond Ground off Hastings; J. S. Bowerbank.

Examined.—In the dried state.

This sponge is parasitical on the branch of a sertularia, embracing it closely for about two inches of its height; the surface is quite smooth, and with the aid of a two-inch lens has much the same finely reticulated appearance as that of a specimen of *Halichondria panicea*, for which, under these circumstances, it might be readily mistaken. The oscula are few and simple in their structure. In a piece of the dermis mounted in Canada balsam many of the triangular areas of the confluent rotulæ were furnished with from one to three or four open pores, while in other such spaces none were apparent. The most striking character in this remarkable sponge is in the structure of its dermis, which consists of a thin transparent membrane and a regular and beautiful reticulated structure in the form of a series of hexradiate confluent rotulate areas, the interspaces between the radii being always of a triangular form. The effect as presented to the eye by the outer surface of a small piece of the dermis mounted in Canada balsam is very remarkable. Each of the confluent areas appears perfect in itself, while at the same time each of it forms, as it were, a part of a neighbouring area. The fibre of the rete is multispiculous, compact, and very uniform in its diameter, so that the whole structure presents a very regular and beautiful appearance.

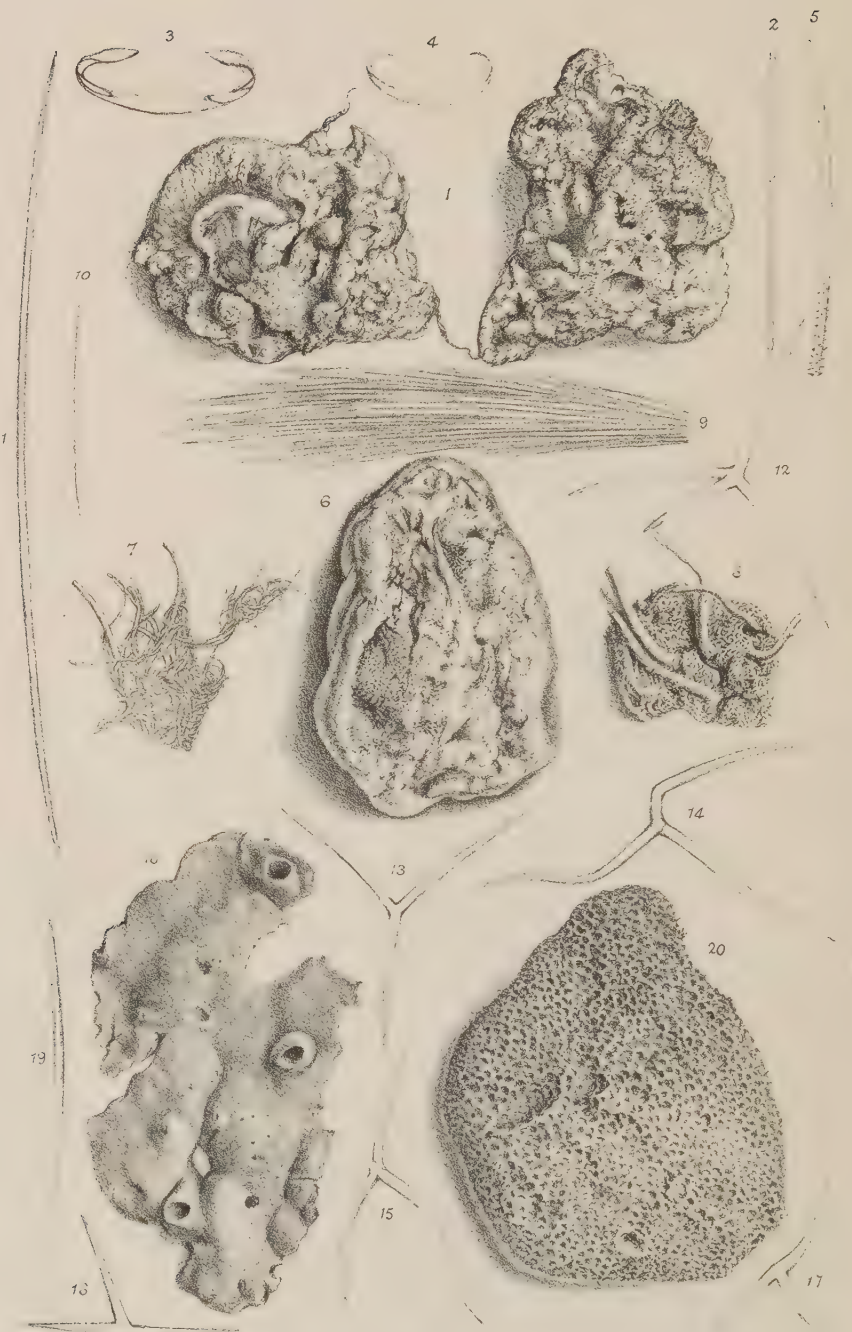
I have never met with this structure in the dermis of any other sponge; but it is a remarkable fact that the whole of the skeleton of the siliceo-fibrous sponge from Porto Rico, in the Museum of the Jardin des

Plantes at Paris, described and figured by me in the 'Proceedings of the Zoological Society of London' for 1869, and designated *Iphiteon panicea*, is constructed on the same principle of confluent rotulate areas of solid siliceous fibres. No fragments of the expansile dermal system of this sponge were to be found on the specimen.

The structure of the skeleton is not symmetrical like that of the dermis. The fibre is stout and compact, and in the deeply seated portions of the sponge it does not appear to assume any especial direction; but immediately beneath the surface the fibres take a direct course to the inner surface of the dermal membrane, upon which they terminate, dividing and spreading over it, and so forming its beautiful confluent rotulate dermal rete.

In some parts of the interstitial membranes the tension spicula are very numerous, while in other parts they are very few in number.

Plate XCI.



Isodictya rugosa 1—5. Leuconia Somesii 6—17.
Halichondria Mc Intoshii 18—19. Dysidea coriacea 20.

W. Lens Aldous, del et lith.

W. West & C.° imp.

PLATE XCI.

ISODICTYA RUGOSA, *Bowerbank.*

Fig. 1.—Represents the type-specimen. Natural size.

Fig. 2.—One of the subfusiformi-acerate tension spicula of the dermal membrane. × 250 linear.

Fig. 3.—A large-sized equi-anchorate retentive spiculum from the dermal membrane. × 530 linear.

Fig. 4.—One of the largest of the simple bihamate retentive spicula of the dermal membrane. × 530 linear.

Fig. 5.—An average-sized acuate basally-spined skeleton spiculum. × 250 linear.

LEUCONIA SOMESII, *Bowerbank.*

Fig. 6.—Represents the type-specimen in a fully-developed condition. Natural size.

Fig. 7.—A very young specimen of the species, consisting of a congeries of fistulæ only. Natural size.

Fig. 8.—A young specimen in a more advanced stage of development, with large cloacal fistulæ projected from a basal mass. Natural size.

Fig. 9.—One of the small cloacal fistulæ covered with long, slender, acerate, external, defensive spicula, from the surface of the type-specimen represented by fig. 6. × 36 linear.

Fig. 10.—An acerate defensive spiculum from the cloacal organ, represented by fig. 9. × 250 linear.

Fig. 11.—One of the large, slender, acerate, procumbent spicula from the large cloacal fistulæ. × 250 linear.

Fig. 12.—One of the internal, spiculated, equi-angulated, defensive spicula from the interior of one of the large cloacal fistulæ. × 250 linear.

Fig. 13.—An equi-angulated, triradiate, skeleton spiculum of the normal form. × 250 linear.

Figs. 14, 15.—Two examples of the distorted forms of the equi-angulated, triradiate, skeleton spiculum. × 250 linear.

Fig. 16.—One of the rectangulated, triradiate, skeleton spicula in very nearly its normal form. × 250 linear.

Fig. 17.—A slightly distorted example of the rectangulated, triradiate, skeleton spiculum. × 250 linear.

Halichondria McIntoshii, *Bowerbank.*

Fig. 18.—Represents the type-specimen. Natural size.

Fig. 19.—An average-sized, acerate, skeleton spiculum. × 250 linear.

Dysidea coriacea, *Bowerbank.*

Fig. 20.—Represents the type-specimen. Natural size.

Isodictya rugosa, *Bowerbank.*

Plate XCI.

Sponge massive, sessile, parasitical on fuci or zoophytes. Surface uneven, very rugose. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; tension spicula, sub-fusiformi acerate, disposed in numerous flat fasciculi, or dispersed; retentive spicula; bidentate equi-anchorate, very variable in size, rather numerous; and simple and contort bihamate, very variable in size, numerous. Skeleton.—Irregular, primary lines multispiculous, secondary lines rarely more than bi-spiculous; spicula

acuate, basally spinous, or sparingly entirely spinous. Interstitial membranes. Tension spicula same as those of dermal membrane, few in number, dispersed; retentive spicula, same as those of dermal membrane.

Colour.—In the dried state, dull ochreous yellow.

Habitat.—Diamond ground off Hastings; J. S. Bowerbank.

Examined.—In the dried state.

I received two small specimens of this sponge parasitical on the same slender stems of a fucus; the specimens are separated from each other by about half an inch. In every respect they very closely resemble each other, the surfaces of both being remarkably rugged and uneven. The oscula are mostly situated in the deepest portions of the rugged surface; they are not readily to be detected without close observation, or by the aid of a lens. The distribution of the tension spicula on the dermal membrane is very irregular. On the sides of some of the deep depressions of the surface they are very regularly disposed in parallel flat bundles, while on other parts their disposition is quite irregular, but in all their conditions they are very characteristic. They are equal in length, but much more slender than the skeleton spicula, and they are perfectly free of spines.

There is a great disparity in the sizes of both the bidentate equi-anchorate and the bihamate retentive spicula. Some of the anchorate spicula are remarkably large and strong in their proportions; one of the largest measured $\frac{1}{666}$ inch, in length and the diameter of the shaft was $\frac{1}{5000}$ inch, while one of the smallest of the same form was but $\frac{1}{2000}$ inch in length; the smaller forms are very much more numerous than the large ones. These spicula are very puzzling objects, even beneath a power of five or six hundred linear.

It is very rarely that both of the teeth at each termination of the spiculum can be distinctly defined.

Two of the teeth, on one side of the spiculum, are distinctly defined while the opposite two appear obsolete. This deceptive appearance apparently arises from the dentæ being very thin and flat, and as the spicula are rarely evenly balanced on the bow, those on one side present their flat surfaces to the eye while the thin edges of the other two are scarcely visible.

The bihamate spicula vary in size to a corresponding degree; the length of one of the largest being $\frac{1}{857}$ inch in length while many of the smaller ones did not exceed $\frac{1}{2000}$ inch in length. Among the latter description of retentive spicula the contort form appeared to be quite as numerous as the simple bihamate ones.

The spination of the skeleton spicula varies to some slight extent. The spines are strongly produced at the base of all of them, but the spination of the shafts and apices of the spicula are comparatively few in number, and frequently they are but very sparingly produced.

Leuconia Somesii, *Bowerbank.*

Plate XCI.

Sponge, in the young state, a congeries of thin fistulæ, like a *Leucosolenia*; when adult, massive, furnished with numerous thin conical or cylindrical cloacal organs, very variable in size and length. Surface of the mass smooth and even. Small cloacæ furnished with numerous long, slender, acerate, external, defensive spicula projected ascendingly at small angles to the surface; large cloacæ nearly destitute of external defensive spicula, furnished with a few long, slender, acerate, procumbent spicula; internal defensive spicula of cloacæ, spiculated, equi-angular, triradiate; spicular ray slender and attenuated. Oscula minute, distributed on the inner surfaces of the cloacæ. Pores unknown. Dermal membrane pellucid,

aspiculous. Skeleton.—Spicula equi-angulated and rectangulated, triradiate, small and very numerous; radii slender and unequal in length and distorted.

Colour.—Cream-white, alive and dead.

Habitat.—Brighton Aquarium; Henry Lee, Esq.

Examined.—In the dried state.

I am indebted to my friend, Mr. Henry Lee, for my knowledge of this species. He found it growing on the artificial rock work in the tanks of the Brighton Aquarium. He sent me six specimens of it; three in the young condition and three in the adult state. The three young ones were in progressive stages of development. The first and second of them were each a congeries of rather long and slender tubuli, without any solid basal mass, very closely resembling large straggling specimens of *Leucosolenia botryoides*. These tubuli are longer, but less in diameter than those of the larger description of cloacal organs on the adult sponges, but they are much larger in every respect than the numerous minute cloacæ, which are so numerous on the surface of the fully-developed sponges. The third one of the young specimens was especially interesting as it formed a complete structural link between the first two young specimens and the fully-developed ones; there being in this case a thin, solid, basal stratum profusely furnished on its upper surface with the minute cloacæ and having also six of the large cloacal organs projected from its surface.

My friend, in his note to me in treating of these young specimens and their cloacal organs, and especially of the third one, writes, "When the nodular mass is removed from the water, *however gently*, they sink down and become flaccid and do not stand out from the body of the sponge as they do in life." In the stage of development of the third of the young sponges there appears to be more of the large description of cloacal organs than there usually are on the large and fully-developed specimens.

The other three specimens are in the adult stage. I divided the smallest of them longitudinally (it is rather more than an inch in length), and found it to be quite solid, without the least indication of internal cavities. The greatest thickness of the largest specimen, the one represented by fig. 6, Plate XCI, does not exceed seven lines. It is exceedingly fragile and in the dried state it has quite a mealy feel to the touch. When examined in the dried state by direct light the upper surface is seen to be crowded with minute cloacal organs among which there are a few of larger size and conical shape. These large organs are comparatively smooth, while the numerous minute ones are abundantly furnished with very long and slender acerate defensive spicula. When these organs are in a perfect condition these defensive spicula are so abundant as to completely obscure the oscular surface, and, in many cases, they are projected to a considerable extent beyond the distal extremity of the organ, and they are so numerous, long, and slender as to cause it very closely to resemble a camel's-hair pencil in a dry condition, when viewed in Canada balsam with a power of about 100 linear. No such defensive appendages appeared on any of the few larger cloacal organs that were observed.

The large description of cloacæ did not exceed a line and a half in diameter and rather more than three lines in length; the small ones varied from $\frac{1}{133}$ inch in diameter to $\frac{1}{300}$ inch. The long, slender, defensive spicula of these organs varied in length from $\frac{1}{30}$ to $\frac{1}{100}$ inch, and their diameters rarely exceeded $\frac{1}{4000}$ inch. These organs do not appear to assume any definite direction in their procumbent state, but are disposed in every possible direction, overlying each other, frequently three or four deep.

In one of the smaller cloacæ, sectioned longitudinally, the oscula were very distinctly exhibited by direct light with a power of 100 linear on the inner surface of the organ; those near the distal extremity being

larger and more numerous than near the middle of the cloaca. The oscula can rarely be seen on the outer surface, the abundance of the long, slender, defensive spicula entirely obscuring them; those seen on the inner surface were in an open condition.

The skeleton structures in this species are remarkably delicate and slender. In the mass of the sponge and in the cloacæ the skeleton is composed of very numerous, equi-angulated and rectangulated, triradiate spicula, closely matted together, with an intermixture of the long, slender, acerate ones. In the cloacal organs the latter form are disposed without any apparent order, but in the mass of the sponge they frequently assume a subfasciculate mode of deposition.

The normal forms of the skeleton spicula are purely equi-angulated and rectangulated, triradiate, the former predominating greatly in number; but it is a singular fact that neither form is frequently found in a normal state, their radii in almost every one being more or less distorted, indeed the distortion appears to almost amount to the rule instead of the exception.

The distortion of the radii of triradiate skeleton spicula is evidently caused by the closely felted mode of their disposition. The extreme expansion of two of them measured, was $\frac{1}{300}$ and $\frac{1}{333}$ inch.

The spiculated triradiate internal defensive spicula of the large description of cloacæ were of the same size as those of the skeleton; the spicular ray being straight and of about the same length as the other three. They did not appear to be very numerous, and the spicular ray is projected at about right angles, to the inner surface of the cloaca.

The only other known British calcareous sponge with which this species is likely to be confounded is *Leucosolenia botryoides*, and then only in its young and immature state; but even in this condition it is, by careful microscopical examination, readily to be sepa-

rated from that species. The mode of disposition of the skeleton spicula in the two species is strikingly different. In *L. botryoides* they very closely approach regularity of arrangement; while in *L. Somesii*, they appear as if felted together, so that their radii in crossing each other are bent and distorted in various directions, so that although in size and proportions the spicula of the two species closely resemble each other, the regularity in the form of the one species and the distortions of the radii of the other readily discriminate them, even when separated from the parent sponges. The total absence in the skeleton of *L. botryoides*, of the long, slender, acerate spicula, so abundant in *L. Somesii*, also greatly aids us in their discrimination. The spicular triradiate internal defences of the two species also differ essentially in form and mode of disposition. In *L. Somesii*, the spicular ray is comparatively short and straight, and is projected at about right angles to its triradiate base; while in *L. botryoides* it is much longer in its proportions, and is curved in the direction of the terminal orifice of the sponge.

The figure 1, Plate III, of *Leucosolenia botryoides* representing a specimen from Shetland is so exceedingly like in its external characters to the young state of *Leuconia Somesii*, that I was induced to re-examine it microscopically, and I have satisfied myself that it is truly *Leucosolenia botryoides*. This striking similarity of the young state of the former species with the more than usually developed condition of the last named one, strongly illustrates the inutility of depending on external form as a specific character without careful reference to their anatomical structures.

My friend, Mr. H. Lee, in his description of this sponge in 'Land and Water,' for September 29th, 1873, p. 445, gives some interesting notes regarding the growth, development, and decease of this species. He states—"the sponge above described increased in diameter for six months from its first appearance, and then gradually ceased to spread, but continued slowly

to thicken upwards and become more convex. In September, I missed, one by one, the patches of it, which I had so long persistently observed, and supposed that they might have been rubbed off by the fish, or, accidentally, by the men in charge of the tanks. I found, however, that in all cases they were sloughing away and becoming disintegrated, and it was then exceedingly difficult to remove one entire. Even the act of lifting it gently from the water in a muslin net caused them to fall to pieces and break up into a creamy sediment possessing little more consistency than bread sauce. A fine specimen of *Hymeniacidon caruncula*, which appeared in one of the tanks in September last year, and in the course of five months formed a circular patch more than a foot in diameter, sloughed away in a similar manner after it had ceased to grow. From this, and the reappearance in abundance of *Leuconia Somesii*, at the same period this year as last, it seems probable that some sponges attain their full growth in about six months, and live no longer than one year."

It is exceedingly gratifying to find that that magnificent institution, the Brighton Aquarium, will not only bring us acquainted with the habits and manners of the finny tribes inhabiting it, but that its beneficial effects will in all probability be extended to greatly advance our knowledge of new species of other marine animals and the progressive development of the protozoa and other interesting denizens of our surrounding seas. My friend Mr. Henry Lee has aptly suggested that this, the first new highly interesting species of British sponge developed in the tanks of the aquarium should be named after the chairman of the company George Somes Esq., who has taken such a deep interest in the successful foundation and completion of that noble institution.

Halichondria McIntoshii, *Bowerbank.*

PLATE XCI.

Sponge: coating thin. Surface smooth and even. Oscula more or less elevated, dispersed. Margins thin. Pores inconspicuous. Dermal membrane aspiculous. Skeleton.—Very irregular; rete mostly unispiculous, occasionally bi- or trispiculous; spicula acerate, short, and stout. Interstitial membranes aspiculous.

Colour.—In the dried state, light nut-brown.

Habitat.—St. Andrew's, Scotland; Dr. McIntosh.

Examined.—In the living and dried state.

I received seven specimens of this species from Dr. McIntosh, four of them were wet from the sea. In his note accompanying the wet specimens he states, "It is not uncommon at St. Andrew's on the under surface of stones in littoral pools; the specimens sent covered an area of about eight or nine inches. It is of a dull grey colour." In the dried state the colour is light or greyish nut-brown.

The greatest part of the specimens did not exceed the eighth of an inch in thickness, but a portion of one small specimen, an inch in diameter, was nearly a quarter of an inch thick for about half its area, the whole of its surface was much more irregular than those of the other specimens. All of them had evidently been closely adherent to a solid surface. The dermal membrane in the specimen fresh from the sea was in an excellent state of preservation. It was pellucid and closely adherent to the surface of the skeleton beneath, but there was not the slightest indication of any spicula peculiar to that organ. The characters of the oscula varied considerably on the different specimens in regard to their elevation. In some of them they were scarcely raised above the dermal surface, those on the specimen figured exhibit the greatest amount of development observed. I

could not detect the pores in specimens of the dermis when mounted in Canada balsam, all of them being in a closed condition. The nearest alliance with the known species of the first section of our British *Halichondria* is with *H. regularis*. The spicula of the two species are as nearly alike in size and proportions as possible; but this is their only approximation to each other. In their other characters they differ to a considerable extent. The colour of *H. regularis*, in the dried state, is milk-white, while that of *H. McIntoshii* is nut-brown; and in the latter, when viewed by direct light with a power of 50 linear, the pores appear to be irregularly dispersed, while in the former, under the same circumstances, they are seen to be congregated in minute areas. Another important difference is, that while the skeleton rete of *H. regularis* is remarkable for its symmetry, that of *H. McIntoshii* is irregular to a very considerable extent, and it does not possess the distinct unispiculous structure that prevails in the skeleton in *H. regularis*. The skeleton is very irregular in its structure and by far the greater part of it is unispiculous, occasionally the rete is composed of two or three spicula, but these stouter portions rarely extend for more than the length of three or four spicula.

I have named this species after its discoverer, Dr. McIntosh, whose works on the British Annelida, and other branches of natural history, are so well known and so highly appreciated among naturalists.

Dysidea coriacea, *Bowerbank.*

PLATE XCI.

Sponge massive, sessile. Surface slightly asperated. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane coriaceous, rather stout, aspiculous. Skeleton.—Unsymmetrical; fibres large and fistulous;

parietes thin, more or less arenaceous. Interstitial membranes stout, aspiculous.

Colour.—In the dried state, dark ochreous yellow.

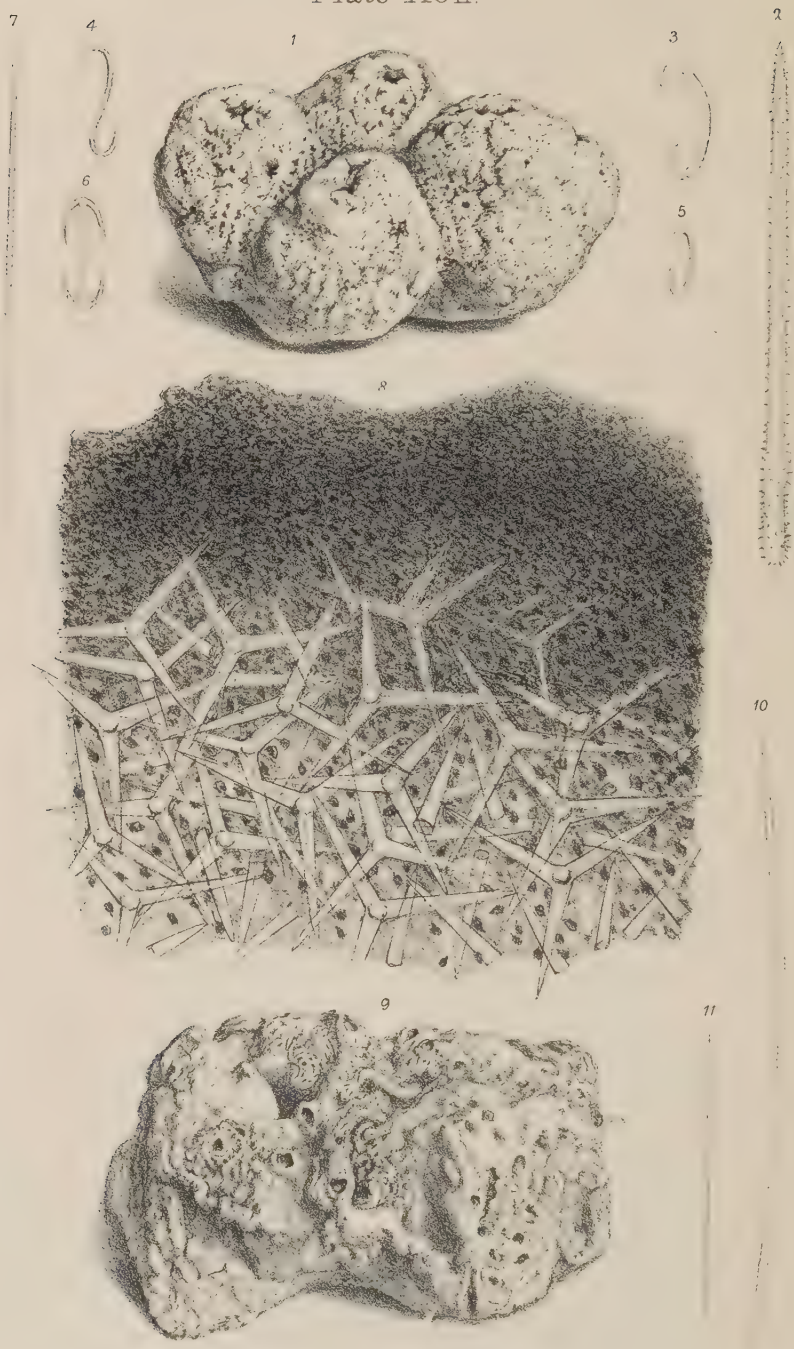
Habitat.—Diamond Trawling Ground off Hastings; J. S. Bowerbank.

Examined.—In the dried state.

I obtained this sponge with some others from one of the Hastings fishermen, and did not recognise it as a *Dysidea* until I had examined it microscopically. Its general aspect is much more that of a *Desmacidon* than of a *Dysidea*. It has, in the dried state, none of the fragile, brittle character of *D. fragilis*, but bears handling and slight compression with perfect impunity, having very much the feeling of damp leather; and it is fortunate that its external characters are so different from those of *D. fragilis*, as in other respects many of them are scarcely separable from those of the last-named species.

The dermis is well preserved in this specimen as a stout, and, comparatively speaking, strong coriaceous membrane, and the skeleton is stronger, tougher, and more open in its structure than that of *D. fragilis;* in other respects the organic structures of the two species very closely resemble each other.

Plate XCII.



Isodictya tumulosa 1–7. Battersbyia Bucklandii 8.
Hymeniacidon Aldousii, 9—11.

W. Lens Aldous, del. et lith

W. West & Co. imp.

PLATE XCII.

Isodictya tumulosa, *Bowerbank.*

Fig. 1.—Represents the type-specimen. Natural size.

Fig. 2.—A skeleton spiculum. × 320 linear. This figure also represents the acuate entirely spined tension spicula of the porous areas.

Fig. 3.—One of the simple bihamate retentive spicula of the dermal membrane. × 530 linear.

Fig. 4.—A contort bihamate retentive spiculum from the dermal membrane. × 530 linear.

Fig. 5.—One of the very minute simple bihamate retentive spicula. × 530 linear.

Fig. 6.—A bidentate equi-anchorate retentive spiculum of the larger size. × 530 linear.

Fig. 7.—A spineless accrate spiculum with semi-hastate termination from the skeleton structure. × 320 linear.

Battersbyia Bucklandi, *Bowerbank.*

Hymeniacidon Bucklandi. Vol. ii, p. 227, Mon. Brit. Spongiadæ.

Fig. 8.—Represents a section of the type-specimen at right angles to the external surface, exhibiting the mode of disposition of the skeleton spicula. × 60 linear.

Hymeniacidon Aldousii, *Bowerbank.*

Fig. 9.—Represents the type-specimen of the species. Natural size.

Fig. 10.—An acuate skeleton spiculum. × 250 linear. This figure also represents the spicula of the dermal membrane.

Fig. 11.—A very slender form of the skeleton

spiculum. × 250 linear that are occasionally found mixed with the larger ones.

Isodictya tumulosa, *Bowerbank.*

Plate XCII.

Sponge. Massive, sessile, furnished with tumulous cloacæ. Surface even or slightly rugose. Oscula within the conical cloacæ. Pores congregated; porous areas irregular, sparingly spiculous; tension spicula few in number, acuate, entirely spined, same size as those of the skeleton; retentive spicula bihamate simple and contort and very minute simple bihamate; also bidentate equi-anchorate, large and small dermal membrane pellucid, reticulated, rete irregular; spicula acuate, entirely spined, same size as those of the skeleton. Skeleton. Primary lines multispiculate; secondary lines rarely more than bispiculous; spicula acuatè, entirely spined, rather short and stout; and rarely spineless acerate with semi-hastate terminations. Interstitial membranes spiculous, spicula same as those of the dermal membranes, few in number.

Colour.—Cream white.

Habitat.—Torquay; J. S. Bowerbank.

Examined.—In the wet and dried state.

The form of this sponge is remarkable and very characteristic, the whole of its upper surface is occupied by four rudely conical tumulous elevations at the summit of each of which there is a cloacal aperture; the surface of the sponge is more or less rugose or papulous, and in the slightly depressed spaces the porous areas are seated. The sponge was preserved in a saturated solution of salt in water. In this state when portions of it were examined microscopically the sarcode was so abundant as to totally obscure its structure, but in the dried state sections of it mounted in Canada balsam at once revealed its true character.

The most satisfactory view of its dermal peculiarities is obtained by the examination of a thin slice from its surface without immersion in Canada balsam, the areas of the pores are then distinctly and beautifully apparent surrounded by dense masses of spicula projected from beneath. The areas rarely have any tension spicula embedded on their surfaces, but they are abundantly furnished with the different forms of retentive spicula. The bihamate spicula are not very numerous and the larger description of bidentate equi-anchorate ones still less so, but the smaller description of the bidentate equi-anchorate ones are frequently abundant and especially so round the margins of the open pores, when the same slice from the dermal surface has been immersed in Canada balsam these characters are rendered very much less distinctly as the membrane becomes very translucent.

The retentive spicula are important characters in the discrimination of the species, although they are very small, requiring a power of about 700 linear to render them distinctly to the eye. The bihamate ones are of two distinct forms, the largest are mostly contort with slender shafts and acute terminations, an average-sized one measured $\frac{1}{1304}$ inch in length; the small description of bihamate speculum appears always to be of the simple description, with the hami in the same plane, their shafts are equable in diameter and the terminations of the hami are obtuse; an average-sized one measured $\frac{1}{2400}$ inch in length. The bidentate equi-anchorate spicula were of two distinct sets, but of the same form. The largest were very few in number, they measured $\frac{1}{1250}$ inch in length. The smaller description of the same form were not very numerous, but much more so than the larger ones; an average-sized one did not exceed $\frac{1}{3000}$ inch in length. The skeleton is well developed and the spicula are rather short and stout and well furnished with acutely conical spines, especially towards the bases and apices. Intermixed with this form there are occasionally a few smooth acerate

spicula with one or both terminations more or less hastate. This form is mostly found incorporated with the primary lines of the skeleton near their distal termination. They are as long as the acuate skeleton ones but not more than about half their diameter.

Battersbyia Bucklandi.

Plate XCII.

Hymeniacidon Bucklandi. Vol. ii, p. 227; Vol. iii, plate xxxviii, Mon. Brit. Spongiadæ.

In my description of this sponge under the above designations in vol. II page 226, in the last paragraph page 228, I have stated that "This sponge varies so widely from the ordinary structure of Hymeniacidon that I doubt much whether it should not have been made the type of a new genus." At that time I had not seen any other species of sponge with a similarly remarkable series of skeleton spicula dispersed amidst its interstitial membranes, and I therefore placed it in the genus Hymeniacidon until further information should arise to enable me to assign it to its proper place in the systematical arrangement of our British sponges, and it was not until several months after the figure of the species was printed in Plate XXXVIII in the present volume, that I received a specimen of a second species of this remarkable genus from my friend Captain Charles Tyler who informed me that the specimen was from Florida. The British one, and the new species, are very different in their external characters. The latter, although its skeleton is in perfect structural accordance with the British sponge, possesses none of the extreme solidity of that species, and it differs materially in its external form and in the forms of its auxiliary spicula. I have also received from my friend Captain Tyler, a small fragment of what is apparently a third species of the same genus, which he received from Count Pourtalès, who labelled

it *Sphinctrella horrida*, C. Schmidt, but I have not been able to ascertain whether it has yet been described or figured. I have, therefore, thought it advisable under all these circumstances to separate the British species from Hymeniacidon, and to construct a new genus for its reception under the designation of Battersbyia, in acknowledgment of the good services rendered to science by my friend Dr. Battersby, to whom I am indebted for my first knowledge of the British species, and I propose the following as the generic character.

BATTERSBYIA, *Bowerbank.*

Skeleton.—A somewhat regular complication of spiculated triradiate, and biangulated quadriradiate siliceous spicula.

The two forms of spicula are of about the same relative size, and they are mixed in the skeleton structure in quite an irregular manner. From the various positions of the two forms in the skeleton, they are not always readily to be distinguished from each other, but as I have stated in vol. ii, p. 227, "they may always be determined by the fact that, in the spiculated triradiate form, the central canals at their junction at the middle of the spiculum form three angles of each about 120°, and three others which are right angles, while those of the biangulated quadriradiate spiculum form four right angles only at their junction at the centre of the spiculum, as represented in Plate XXXVIII, fig. 12, in the present volume.

HYMENIACIDON ALDOUSII, *Bowerbank.*

Plate XCII.

Sponge massive, sessile. Surface smooth. Oscula simple. Pores inconspicuous. Dermal membrane

abundantly spiculous; spicula acuate, long and slender, same size and form as those of the skeleton, dispersed irregularly. Skeleton. Rather open and cavernous, spicula acuate, long and slender, evenly diffused. Sarcode abundant.

Colour.—In the dried state, light fawn brown.

Habitat.—Torquay; J. S. Bowerbank.

Examined.—In the dried state.

I obtained this sponge at Torquay, and preserved it in the condition it came from the sea in saturated salt and water, small sections in this condition were perfectly impermeable to light, and its structure could not be determined until the sections were mounted in Canada balsam; the abundance of sarcode totally obscuring the vision. The dermal membrane is pellucid and abundantly spiculous, the spicula being dispersed as if thinly felted together on its surface, and no difference exists in either size or form from those of the skeleton tissues. A few small simple oscula were visible on the surface of the sponge, but the large orifices represented in the figure are the mouths of numerous membranous tubes of annelids that inhabited the sponge when alive, and which might readily have been mistaken for oscula by a hasty observation. The only species of Hymeniacidon with which there is any probability of confounding this species is *H. caruncula* and *fallax*. From the former it would readily be distinguished by the difference of its external characters, and the difference of the spicula also readily distinguishes them, the skeleton spicula of *H. Aldousii*, being longer and more slender than those of *H. caruncula*, the length of the latter to the former being as 7 to 10. The spicula of *H. fallax*, are also less than those of *H. Aldousii*, being as about 4 to 5 in length, and also by being more or less fusiform in shape while those of *H. Aldousii* are purely acuate, and no flexuous spicula are apparent. The difference in their general aspect also greatly assists in discriminating them. The simplicity of the structure

in *H. Aldousii*, and other nearly allied species renders the above differential characters more than is usually necessary in the discrimination of the species.

I have named this species after my old friend, Mr. W. Lens Aldous, who has drawn the figure representing it on stone in the eighty-second year of his age, with all the accustomed beauty and accuracy that characterises the whole of the plates contained in this work.

ADDITIONS.

In the gradual accumulation of the material for the history of the British Spongiadæ many of the species have been described and figured from single specimens in an imperfect state of preservation and from small portions or even fragments only, of the perfect sponges. Since the publication of the descriptions in Vol. II, and also since the delineation of the figures in Vol. III, I have been in the habit of receiving from various sources fresh specimens of rare and unique species in a fine state of preservation, frequently affording additional information regarding their structure and habits, or strong confirmatory evidence elucidating doubtful points in their history. I have, therefore, thought it advisable in all such cases to publish the results of the examination of such specimens, as a supplement to the histories of the respective species to which they are related, and for the greater facility of reference. I have arranged these notes under the heads of their respective genera, rather than in the order in which they have been acquired.

The following is a list of the genera and species thus treated on.

Ecionemia ponderosa.
Microciona fictitia.
Hymeniacidon coccinea.
— *placentula.*

Halichondria glabra.
— *Pattersoni.*
Raphiodesma sordida.
— *lingua.*
Isodictya densa.
— *Hyndmani.*
— *indistincta.*
Demacidon copiosa.
Chalina Flemingii.
— *inornata.*

Ecionemia ponderosa, Plate VIII.

I received among other specimens from the Diamond trawling ground off Hastings, a very fine specimen of this sponge. It is rather larger than the figured one, and it closely resembles it in form, exhibiting the same disposition to divide into two large lobular masses. The anatomical structures are in perfect accordance with those of the type-specimen. There are no indications of a basal attachment, and it has apparently been freely floating about for a considerable period. I have since received a small specimen, not quite two inches long by one inch wide, without the lobular projections, and like the larger ones without any indication of basal attachment.

Microciona fictitia, Plates XXIII & LXXXII.

Early in February, 1873, I received from Miss Oliver, a dealer in natural-history specimens at Hastings, several specimens of sponges fresh from off the Diamond ground. Among them was an old oyster-shell three inches in width, around the inside edge of the gibbous shell there was a thick incrustation for about an inch in width, and smaller patches were also on the margin of the inside of the flat shell. When

alive, the colour was a deep flesh-red, and it retained that colour, but of a lighter tint when dried. The structural characters were precisely the same as those of the specimens previously described, with the addition of gemmules which I had not observed in either of the other specimens. These organs were membranous and aspiculous, and some of them were filled with well-developed spherical molecules.

Hymeniacidon coccinea, Plate XXX.

Among the sponges I received for examination from the Liverpool Museum, there was a specimen of this species, parasitical on the stems of a slender fucus, binding them together into an irregular elongate mass about three inches in length. The surface in the dried specimen was of the same colour as that of the type one and somewhat more uneven and rugged, and the structural characters were the same in both. It was found in Belfast Lough, in 1872, by Mr. Thomas Higgin, of Huyton, near Liverpool.

Hymeniacidon placentula, Plate LXXII.

Since the description of this species in the present volume p. 185, I have received a third specimen of this sponge for examination from the Rev. A. M. Norman, labelled "Shetland Haaf." It is very like the one represented in Plate LXXII, fig 5, but about an inch less in length. In its anatomical characters it is precisely the same.

Halichondria glabra, Plate XLI.

Among some other sponges obtained at Hastings, I found a specimen of *H. glabra*, parasitical on a sertularia, in the form of a thin, flat, irregularly-formed cake

of sponge, rather exceeding an inch and a quarter in diameter. The external surfaces of both sides were the same. The type-specimen from Scarborough thinly coats a mass of sandstone, and it is interesting and instructive to find a specimen of the same species under such differences of form and location.

Halichondria Pattersoni, Plate XLVI.
Raphiodesma Sordida, Plate LXXVI.

Among some specimens I received from one of the Hastings trawlers from the Diamond ground, on a branch of *Sertularia filicula* there were two specimens of sponges, one above the other. The upper one was an irregular but compact dark-brown mass, three fourths of an inch in its greatest diameter, of *Halichondria Pattersoni;* the lower one, immediately beneath *H. Pattersoni*, was an irregular shrivelled elongate specimen of *Raphiodesma sordida*, exceeding an inch in length and about a quarter of an inch in breadth, of a dull, ochreous, yellow colour, in the dried state. Both sponges are in an excellent state of preservation, and in every respect they agree in their anatomical structures with the types of their species.

Raphiodesma lingua, Plate LXXVII.

The Rev. A. M. Norman has informed me that he has a specimen of this species from Shetland that is eleven inches in height, six and three quarters in breadth near the base, four inches near the middle, and one and a quarter inch in thickness. Its form is irregularly tongue-shaped. It would thus appear that this species frequently attains to a considerable size.

Isodictya densa, Plate L.

Among the sponges sent to me for examination from the Liverpool Museum, there was a box containing numerous fragments of this species. They were in an excellent state of preservation, and in every character were in perfect unison with the type-specimens from Polperro by Mr. Norman.

Isodictya Hyndmani, *Bowerbank.*

Halichondria Hyndmani, Plate XLVI.

From the very thin deposit of this sponge on the shells of *Pecten opercularis*, on which it is usually found, and from the complicated nature of its growth, it is very often diffcult to determine the genus, as unless the specimen of an Isodictya be viewed in a section at right angles to its surface, it is very apt to be mistaken for a Halichondria, and this has been my case in describing this species, in the first instance, from the limited number of specimens in my possession. In re-examining a considerable number of fresh ones in a much finer condition than those on which I founded the species, *Halichondria Hyndmani,* I have been irresistibly led to the conclusion that the species is truly an Isodictya. A certain amount of alteration in the specific description will, therefore, be necessary, and I propose that the following should be substituted for the original one, page 264, Vol II.

Isodictya Hyndmani, *Bowerbank.*

Sponge.—Thinly coating or branching, and anastomosing; branches issuing from small attenuated bases, slightly compressed, terminations corymbose.

Surface rugose, hispid. Oscula and pores inconspicuous. Dermal membrane thin, transparent, furnished with a few dispersed bidentate inequi-anchorate retentive spicula. Skeleton.—Primary and secondary lines nearly equally spiculous, disposition of the skeleton irregular and more or less confused, lines usually bi- or trispiculous. Spicula attenuato-acuate, semi-spined basally, rather stout. Internal defensive spicula attenuato-acuate, entirely spined, few in number. Interstitial membranes. Tension spicula cylindrical, slender, and flexuous; retentive spicula bidentate inequi-anchorate, minute, dispersed, and simple and contort bi-pocillated anchorate spicula, minute, dispersed. Sarcode abundant, dense and purple in the dried state.

Colour.—Alive, light yellow; Rev. Walter Gregor; purple; J. S. Bowerbank. In spirits, dark purple; when dried, brown with a tinge of purple.

Habitat.—Strangford Lough; Messrs. G. C. Hyndman and Wm. Thompson. Moray Firth; Rev. W. Gregor. Hastings; J. S. Bowerbank.

Examined.—From spirit, alive and dry.

This sponge is usually found on shells of *Pecten opercularis*, but I have once found it parasitical on a slender branching zoophyte which it closely embraced in a thin leaf-like form, about two inches in height.

Isodictya indistincta, Plate LII.

In examining a series of duplicate specimens of *Halichondria incrustans*, I found among them a specimen so different in its external characters as to induce me to make a microscopical examination of it, and it proved to be the largest specimen of *Isodictya indistincta* I had yet seen. It is a widely conical-formed mass, the apex of the cone being the base of the sponge. It is firmly attached to a small fragment of a bivalve shell, about an inch in breadth, and from this

it gradually expands until it attains a breadth of three and a quarter inches at its distal extremity, a height of three and three quarter inches, and a thickness of one and a half inch. One side of the sponge is gibbous, and the other flat and worn as if by attrition. On the convex side there are numerous dispersed simple oscula, one only exceeding the eighth of an inch in diameter. In form, size, and general appearance it differs to a great extent from the figured specimens of the species represented in Vol. III, Plate LI, figs. 1 and 2. But in its anatomical characters it is identical with the structures of those specimens, and strikingly so with the dermal peculiarities of the species; the large irregular aspiculous porous areas being very abundantly produced.

Desmacidon copiosa, Plate LXXXII.

Among some British sponges received from Miss Oliver, there was a specimen of this species two inches in length and rather more than one inch in width, and about half an inch in thickness. When alive it was of a dull flesh-red colour and rather firm to the touch, and in its structure it was much more solid and compact than the type-specimen represented in Plate LXXXII, fig. 2. I received also at the same time an oyster-shell encrusted with *Microciona fictitia*, and upon the shell there grew a specimen of sertularia filicula, parasitical, in the midst of which there was another specimen of *D. copiosa*, binding the fronds of the zoophyte together into a mass an inch and a half in length by an inch in width. This specimen in form was very like the type one.

Chalina Flemingii, Plate LXVIII.

Among some old stones received from my kind friend Mr. C. W. Peach, I found a specimen of a

branching sponge very like a stunted specimen of *Chalina oculata*, but with distinctive characters in its form, that induced me to examine it more closely, and on submitting sections of it to microscopical examination in Canada balsam it proved to be a specimen of *C. Flemingii* in a very much more developed state than the fragment figured in Plate LXVIII, fig. 1, as the type of the species with which, in its anatomical details, it agreed perfectly. In the type-specimen, which appears to me to have been but a portion of a more perfect specimen, the form is more or less latticed by inosculating branches; but in the specimen now under consideration the general aspect of its form is very like that of *Chalina oculata*. It has a short stout pedicel an inch in height, and above this divides into numerous branches, dichotomously or trichotomously which frequently assume more or less of a compressed fan-like shape, and the distal terminations of the branches, unlike those of *C. oculata*, are thick and very obtuse; the oscula were small and simple and irregularly dispersed, not exhibiting any disposition to lateral linear arrangement as in the branches of *C. oculata*. The height of the sponge is three and a half inches, and its greatest breadth two inches. These differences in the forms of the two species are of considerable importance in their discrimination.

Chalina inornata, Plate LXXXIII.

Since the figuring of the type-specimen of this species I have received several specimens from the Rev. A. M. Norman who found them in Bantry Bay. They are about the same size as the Cornish one, and they fortunately had the dermal membranes in a fine state of preservation, thus enabling me to correct and complete the specific characters of the species. In the Bantry Bay specimens, the dermal membrane is abundantly spiculous and the spicula are nearly all of them

of the large acuate form that I described in the structure of the sponge, Vol. II, page 277, in treating of the skeleton spicula, as "small and slender, numerous, and the same form, large and long." They are irregularly disposed and among them there are a few bihamate retentive spicula, none of which were observed in the examination of the small fragments of the dermal membrane of the type-specimen. A few of the smaller descriptions of acuate spicula were intermixed with the larger forms in the dermal membrane, and on the interstitial membranes the small slender ones were very much more abundant than on the same tissues in the Bantry Bay ones. The great difference in the size of the tension spicula in the two forms of membrane is an unusual circumstance, and it thus becomes an important specific character in the discrimination of the species. The dermal membrane is rather thick, and in the dried state it is of a light fawn-yellow colour, and from its general appearance it is very probable that in the living state the surface would be smooth and even. Under these circumstances the following should be substituted for the specific character in page 277, of the present volume.

Chalina inornata, *Bowerbank.*

Sponge, massive, sessile. Surface smooth and even. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane, stout, abundantly spiculous; spicula acuate, large, irregularly dispersed, and a few of the same form small and slender, retentive spicula; bihamate, simple and contort, few in number. Skeleton. Rete rather coarse and open, irregular, abundantly spiculous; spicula subfusiformi-acuate, very rarely acerate, small and slender, numerous; and the same form large and long as in the dermis, few in number near the circumference of the fibre. Interstitial membranes, abundantly spiculous, spicula small and slender.

Colour.—In the dried state, light fawn-yellow.

Habitat.—Parasitical on stems of large fuci. Mounts Bay, Cornwall; J. S. Bowerbank. Bantry Bay, Ireland; Rev. A. M. Norman.

Examined.—In the dried state.

CORRIGENDA.

The terminology in Volume I of this work was gradually constructed long before the systematic examination of the species was effected, and during the latter portion of the work in Volume II, many corrections became necessary in the names of both genera and species. I have therefore thought it advisable to record these alterations for the information of students who will find all such corrections by reference to the series of numbers descriptive of the figures in the Plates of Volume III.

VOL. I.

No. 9, vol. i, p. 230, for *Halichondria infundibuliformis*, Johnston, read *Isodictya infundibuliformis*, Bowerbank.

No. 44, vol. i, p. 234, for *Hymeniacodon Bucklandi*, read *Battersbyia Bucklandi*.

Nos. 102—108, vol. i, p. 245. The sponges whence the foliato-peltate spicula were obtained were not known at the time of the publication of vol. i; since then I have had the opportunity of examining and describing many specimens of siliceo-fibrous sponges, in the 'Proceedings of the Zoological Society of London,' and in the expansile dermal system of one of them, from St. Vincent, West Indies, in the collection of the British Museum, which I have designated *Dactylocalyx polydiscus*, 'P. Z. S.,' 1869, page 96, pl. vi, figs. 10 and 11, I have found the peltate spicula *in sitû*, which are evidently the same as those represented in vol. i, 'Mon. Brit. Spongiadæ,' plate iv, figs. 102 and 103, and probably fig. 108, plate v. In another sponge, in the collection of the British Museum, from St. Michael's, Azores, presented by Robert McAndrew, Esq., I found the spicula represented in plate v, figs. 104—107, 'Mon. Brit. Spongiadæ,' *in sitû* in the expansile dermal system. These spicula are represented in plate v, figs. 3—5, 'P. Z. S.,' 1869.

Nos. 123—127, vol. i, p. 248, for *Halichondria Hyndmani*, read *Isodictya Hyndmani*.

Nos. 141—143, vol. i, p. 250, for *Spongia plumosa*, Montagu, read *Microciona plumosa*, Bowerbank.

No. 147, vol. i, p. 251, for *Hymeniacidon lingua*, read *Raphiodesma lingua*.

Nos. 257, 258, vol. i, p. 253, for *Alcyoncellum robusta*, read *Polymastia robusta*, Bowerbank.

No. 274, vol. i, p. 274, for *McAndrewsia*, Gray, read *Dactylocalyx*, McAndrewii, Bowerbank, 'P. Z. S.,' 1869, p. 86.

No. 287, vol. i, p. 275, for *Chalina seriata*, read *Ophlitaspongia seriata*, Bowerbank.

No. 297, vol. i, p. 277, for *Hymeniacidon lingua*, read *Raphiodesma lingua*, Bowerbank.

VOL. II.

Page 78, line 8, *for* spiculate spicula, *read* spinulate spicula.

Page 172. In specific character of *H. consimilis*, line 6, *for* depressed, *read* dispersed.

Page 177, 4th line from bottom of page, for *Hymeniacidon Alderi*, read *Isodictya Alderi*.

Page 270, 6th line from bottom, for *Chalina ficus*, read *Hymeniacidon ficus*.

Page 198, *Hymeniacidon jecusculum*, line 7, *for* spicula acerate, *read* spicula acuate.

Index. *Hymeniacidon virgultosa*, *for* page 393, *read* 193.

Page 235, line 9, *for* fascicula, *read* fasciculi.

VOL. III.

Page 59, *for* Plate LXXIX, *read* Plate LXXXII.

Plate LXXIV, and pp. 208 and 216, *for* tegetecula, *read* tegeticula.

A LIST

OF THE

BRITISH GENERA OF SPONGES,

WITH THE NUMBER OF SPECIES OF EACH FIGURED IN VOLUME III.

Order 1.—CALCAREA.

Grantia	4
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Leucogypsia	1

Order 2.—SILICEA.

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Normania	1
Ecionemia	3
Polymastia	8
Halyphysema	2
Ciocalypta	2
Tethea	6
Halicnemia	1
Dictyocylindrus	12
Phakellia	2
Microciona	12
Hymeraphia	6
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